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PICKERING NGS 'B', UNIT 8
BOILER FEED PUMPSET VIBRATION

Report No 86-335-K

R.B. Jay and W.D. Morgan
Plant Equipment Dynamics Section
Mechanical Research Department

ABSTRACT

Assistance in the commissioning of the pumpsets and their vibration monitoring systems is described. Due to station operational schedules and procedures complete full load vibration data from the station monitoring system has not been obtained for all pumpsets. Though vibration criteria have not been set, pump vibration of P6 and P8 is of the same order as that of pumpsets in other Units at Stations A and B, and considered acceptable. But the motor vibration appears high, though the situation with pumpset P8 is uncertain because of suspected circuit faults. There appear to be vibration monitoring circuit faults associated with pumpsets P5, P7 and P8, and it is recommended that they be rectified, re-calibrated, vibration measurements repeated, and the apparently high motor vibration of pumpsets P6 and P8 investigated.

job	file	date	report no
27-102-452	825.4	January 9, 1987	86-335-K

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EXECUTIVE SUMMARY

PICKERING NGS 'B', UNIT 8 - BOILER FEED PUMPSET VIBRATION

R.B. Jay and W.D. Morgan
Plant Equipment Dynamics Section
Mechanical Research Department

Ontario Hydro Research assisted in the commissioning of the pumpsets and their vibration monitoring systems.

Due to station operational schedules and procedures it has not been possible to get complete full load vibration data for assessment of the condition of all pumpsets and thus provide a base line for future assessments. It is recommended that priority be given to obtaining complete full load data.

Though vibration criteria have not been set, pump vibration of P6 and P8 is of the same order as that of pumpsets in other Units at Stations A and B, and considered acceptable. But the motor vibration appears high, though the situation with pumpset P8 is uncertain because of suspected vibration monitoring circuit faults. There appears to be circuit faults associated with pumpsets P5, P7 and P8 and it is recommended that they be rectified, re-calibrated, vibration measurements repeated, and the apparently high motor vibration of pumpsets P6 and P8 investigated.

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To Mr. K. Talbot
Commissioning Manager
Pickering NGS 'B'

PICKERING NGS 'B', UNIT 8 - BOILER FEED PUMPSET VIBRATION

1.0 INTRODUCTION

Assistance was given to station personnel during commissioning of the Boiler Feed Pumpsets and their associated vibration monitoring systems. The principal objectives were:

1.1 To evaluate the acceptability of pumpset vibration and dynamic characteristics with respect to specifications and/or industry standards.

1.2 To make recommendations for reducing pumpset vibration levels if in excess of limits specified in relevant tendering documents or specifications.

1.3 When necessary, to calibrate vibration sensors.

1.4 To check out, set up and calibrate the vibration monitoring circuits associated with each pumpset.

A brief description of the main boiler feed pumpset is given in Reference 1.

2.0 VIBRATION MONITORING INSTRUMENTATION

For a description of the Vibration Monitoring System and more detailed specifications of the sensors itemized below, refer to Reference 2.

2.1 Sensors on Main Boiler Feed Pumpsets

2.1.1 Velocity (Seismic)

One velocity transducer is mounted vertically on the motor inboard bearing Figure 1, and one horizontally on the pump outboard bearing, Figure 2. These locations and orientations,are different from those at Pickering NGS 'A' but, of the mountings and orientations provided, give the highest vibration reading.

The velocity transducer is a Metrix, Model 5766-08, stock code 641 A 1093.

2.1.2 Phase Marker

The phase marker produces a voltage pulse once per revolution of the shaft and is used as a reference in the analysis of the vibration velocity measurements. The pulse is produced by an electro-magnetic pickup as a key or button on the shaft passes it.

The pickup is Atlas Electronics part number 725148, stock code 742 B 8953 and is mounted at the location shown in Figure 3.

2.2 Sensors on Auxiliary Boiler Feed Pumpsets

2.2.1 Velocity (Seismic)

One velocity transducer is mounted vertically on the motor outboard bearing and one horizontally on the pump outboard bearing, Figure 4.

2.2.2 Phase Marker

The phase marker pickup is mounted as in Figure 4 and is Atlas Electronic's part number 725148, stock code 742B8953.

2.3 Calibration

2.3.1 Velocity (Seismic) Transducers

The velocity transducers on the boiler feed pumpsets have been calibrated by the manufacturer and the calibration test data are attached to a copy of Manual NK30-WAH-60436-9009, assigned to Mr. S.S. Grewal of Pickering NGS 'B'.

2.3.2 Circuit Calibrations

Single point circuit calibrations as described in /2/ were performed for all pumpsets.

Main Boiler Feed Pumpsets

For normal VMS operation the nominal full scale ranges selected in the computer, and by pin jacks on the seismic printed circuit boards in the Seismic Signal Conditioner Cabinet /2 and 3/, are 17 mm/s for the motor (YE1) and 56.6 mm/s for the pump (YE2). These correspond to the M (medium) and L (low) gain settings and were the settings used for calibration on the main boiler feed pump. The calibration voltage input was 20 mV rms, which for a

nominal velocity transducer sensitivity of 3.35 mV/mm/s (85 mV/in/s) and a full scale range setting of 17 mm/s for YE1 is equivalent to a computer readout of 8.45 mm/s pk (0.33 in/s); for a full scale range setting of 56.6 mm/s for YE2 it is equivalent to a computer readout of 28.3 mm/s pk (1.11 in/s).

The following computer readouts were obtained:

COMPUTER READOUTS FOR CALIBRATION INPUTS EQUIVALENT TO 8.45 & 28.3 mm/s

Pumpset No.	6	7	8
Motor I/B Bearing mm/s (YE1)	8.49	8.45	- *
Pump O/B Bearing mm/s (YE2)	28.36	14.05*	28.36

The computer readouts marked by an asterisk indicated faulty circuits. A wiring check was recommended and a Defect Report was filed (see Appendix F) but it has not been possible to establish whether any action was taken.

Auxiliary Boiler Feed Pumpset

For normal VMS operation the nominal full scale ranges selected in the computer, and by pin jacks on the seismic printed circuit board, are 17 mm/s on both motor (YE1) and pump (YE2).

The same full scale ranges were used for calibrations with a voltage input of 20 mV rms, which for a nominal velocity transducer sensitivity of 3.35 mV/mm/s (85 mV/in/s) corresponds to a computer reading of 8.45 mm/s pk (0.33 in/s).

The following computer readouts were obtained for a vibration input equivalent to 8.45 mm/s:

Motor O/B Bearing	8.49 mm/s (YE1)
Pump O/B Bearing	4.46 mm/s (YE2)

The computer readout for the pump outboard bearding indicates a faulty circuit. A Defect Report was filed (see Appendix F) but it has not been possible to establish whether any action was taken.

2.4 Full Scale Range Settings

The signal conditioners and the setting of their full scale ranges are discussed in /2/. During commissioning the ranges found most suitable were:

Main Boiler Feed Pumpsets

Motor I/B Bearing:	17 mm/s
Pump O/B Bearing:	56.6 mm/s

Auxiliary Boiler Feed Pumpset

Motor O/B Bearing:	17 mm/s
Pump O/B Bearing:	17 mm/s

2.5 Vibration Alarms

The alarm function is performed by the Unit Computer. Refer to relevant station information and procedures for the setting of alarm levels.

2.5.1 Vibration Alarm Levels

Unlike most others, the boiler feed pumpsets are subject to large changes in vibration level over the normal range of operating conditions ie from recirculating to full flow. Such large changes make the selection of a suitable alarm level difficult.

No limit is given in the Station Operating Manual, but the computer AI's (analogue inputs) are set as below:

Main Boiler Feed Pumpsets

Pump:	38.1 mm/s
Motor:	15 mm/s

Auxiliary Boiler Feed Pumpsets

Pump:	38.1 mm/s
Motor:	15 mm/s

While it is realized that in setting the alarm limits the aim has been to avoid alarms when the pumpsets are on recirculation, the present limits appear unduly high. See section 2.5.1 of Reference 1.

3.0 PUMPSET COMMISSIONING TESTS

3.1 Structural Natural Frequencies

With all pumpsets idle, the structural natural frequencies of a selected pumpset were determined by exciting it by a blow from a special hammer, having an elastomeric tip, and instrumented with a force transducer. The pumpset response was measured by a magnetically mounted accelerometer driving a charge amplifier. The force and response signals were fed to a two channel FFT frequency analyzer/plotter set to produce plots of compliance transfer functions, from which the structural natural frequencies are obtained. Compliance transfer functions (impact spectra) thus obtained for the main and auxiliary pumpsets are in Appendices A and B.

3.2 Vibration at Full Unit Load

Due to the demands of Station schedules and procedures trend plots of vibration velocity have been obtained for two pumpsets only and are presented in Appendix C. Velocity spectra (obtained using the buffered ac output of the VMS in the Vibration Analysis Room and a Nicolet 660B dual channel analyzer) are given in Appendix D.

3.3 Tape Recordings

The vibration of some pumpsets was tape recorded at full unit load. A log of the recordings in in Appendix E.

4.0 DISCUSSION OF RESULTS

4.1 Structural Natural Frequencies

Examination of impact spectra in Appendix A shows some pumpset natural frequencies close to 2x, 3x and 5x shaft speed. Of these, that generally found in the region of 277 Hz in the horizontal direction at the pump outboard bearing, and near 298.75 Hz the 5x shaft component, appears to be potentially the most troublesome. The 5x5 component generally dominates the running spectra as the Figures in Appendix D show. For a pumpset on which this component is exceptionally high at rated flow, then the seviceability and maintenance records of the pumpset should be reviewed and assessed periodically. If these are found to be poor, it may be advantageous to fit a dynamic absorber to the outboard bearing.

4.2 Unit at Full Load

Owing to constraints imposed by Station operational schedules and procedures, it has only been possible to obtain data from two of the three main boiler feed pumpsets (P6 and P8) and none from the auxiliary boiler feed pumpsets. Of these two, the computer readouts for the motor of pumpset P8 are considered unreliable because of the indication of a faulty vibration monitoring circuit discovered during circuit calibration (see 2.3.2).

Data from the six minute unit computer trend plots in Appendix C are summarized below.

Pumpset	Vibration Velocities - mm/s			
	Motor (YE-1)		Pump (YE-2)	
	Range	Average	Range	Average
P6	2.7 -3.3	3.0	5.0 -5.6	5.4
P7	3.3 -2.7	3.0	7.8 -8.2	8.0

Though vibration limits have not been specified for these pumpsets (but limits have been set as in 2.5.1) pump vibration of both P6 and P8 appears of the same order as that of the pump of Unit 5 at a rated flow of 400 Kg/s (see Figure 6 of/1/) and of pumps at Station 'A' (see Figure 5 of/1/) which are considered acceptable. Note, however, that the transducer locations are different at Station 'B' from those at Station 'A'. In general, the locations at 'B' tend to give higher readings.

The situation is different for the motor vibration. First no reliable unit computer readouts are available for the motor of pumpset P8, but comparison of spectra in Appendix D suggests the level of vibration is of the same order as that for pumpset P6. This is considerably higher than has been observed on other motors at Station 'B' but not as great as many motors at Station 'A' (see Figure 5 of/1/).

In view of the uncertainty about the level of motor vibration of pumpset 8, the vibration circuit should be re-calibrated and vibration measurements repeated. The apparently high motor vibration of pumpsets P6 and P8 should then be investigated for a probable cause.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Pump vibration of pumpsets P6 and P8 is of the same order as that in other units at Station 'B' and is considered acceptable. Motor vibration, however, appears to be higher than in other units and further vibration investigation is recommended.

5.2 The circuitry associated with the motor vibration measurement of pumpset P8 appears faulty (as well as YE2, pump 7 and YE2, pump 5). It is recommended that these circuits be rectified, re-calibrated and vibration measurements repeated.

Approved:

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Mechanical Research Dept

Submitted:

for

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Plant Equipment Dynamics Section

W. Morgan

W.D. Morgan
Technologist
Plant Equipment Dynamics Section

RBJ:mf

REFERENCES

1. R.B. Jay, W.D. Morgan, "Pickering NGS 'B', Unit 5 Boiler Feed Pump Vibration", Research Division Report No 85-229-K, September 20, 1985.

2. R.B. Jay, W.D. Morgan, "Pickering NGS 'B' Vibration Monitoring System", Research Division Report No 83-392-K.

3. R.D. Brown, "Vibration Signal Conditioners Pickering GS - Instruction Manual", Research Division Report No 76-330-K, November 17, 1976.

4. R.B. Jay, W.D. Morgan, "Pickering NGS 'B', Unit 6, Boiler Feed Pump Vibration", Research Division Report No 86-107K

5. R.B. Jay, W.D. Morgan, "Pickering NGS 'B' Unit 7 Boiler Feed Pump Vibration", Research Division Report No 86-125-K, May 1986.

TABLE 1

Test Instrumentation

Accelerometer	B&K 4368
Charge Amplifier	B&K 2635

Bently Nevada Velocity Seismoprobe Part No. 16699, and magnetic mount
Nicolet 660B Dual Channel FFT Analyser

PICKERING NGS "B"

MAIN BOILER FEED PUMPSET

MOTOR INBOARD VIBRATION SENSOR

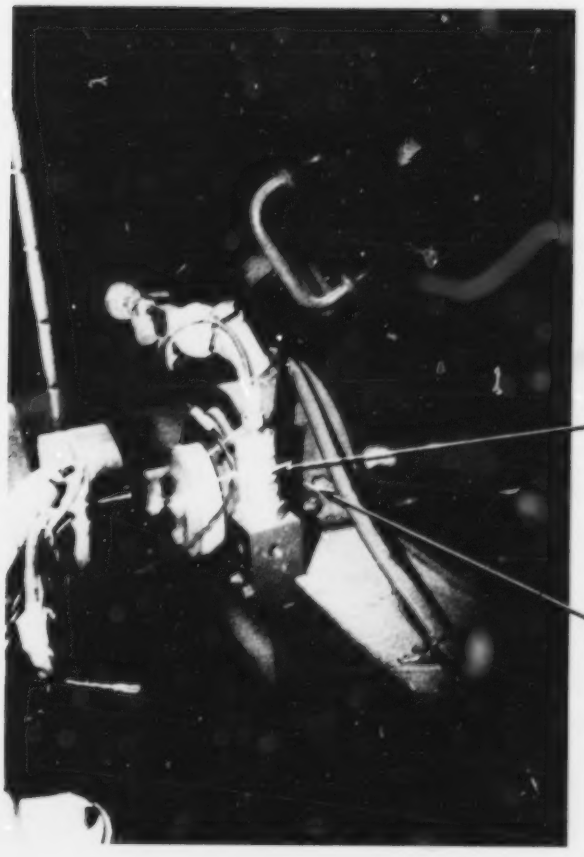


FIGURE 1

169395 RD

PICKERING NGS "B"

MAIN BOILER FEED PUMPSET

PUMP OUTBOARD VIBRATION SENSOR

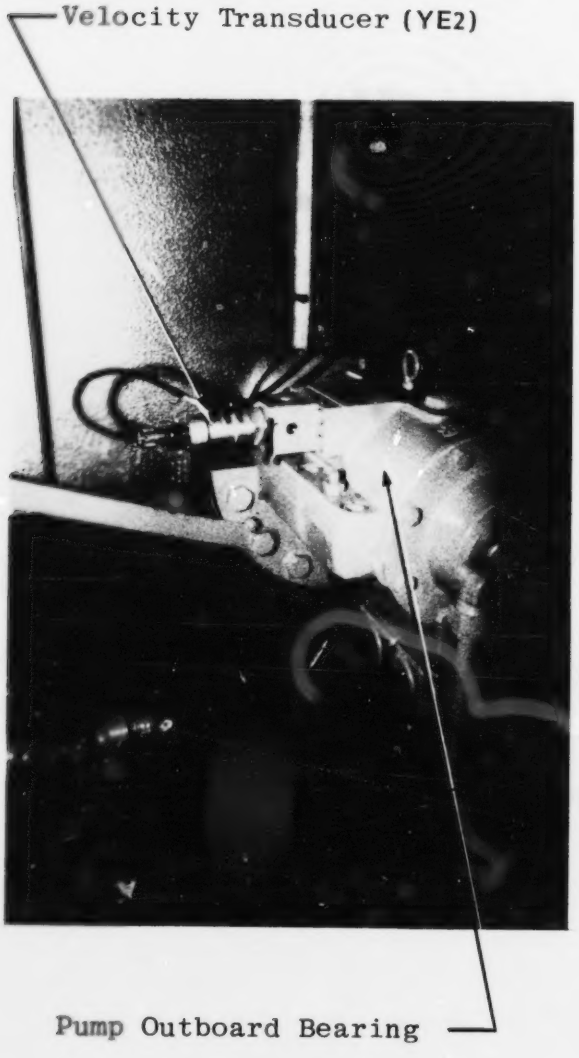


FIGURE 2

169396 RD

PICKERING NGS "B"
MAIN BOILER FEED PUMPSET
PHASE MARKER PICKUP AT
PUMP INBOARD BEARING

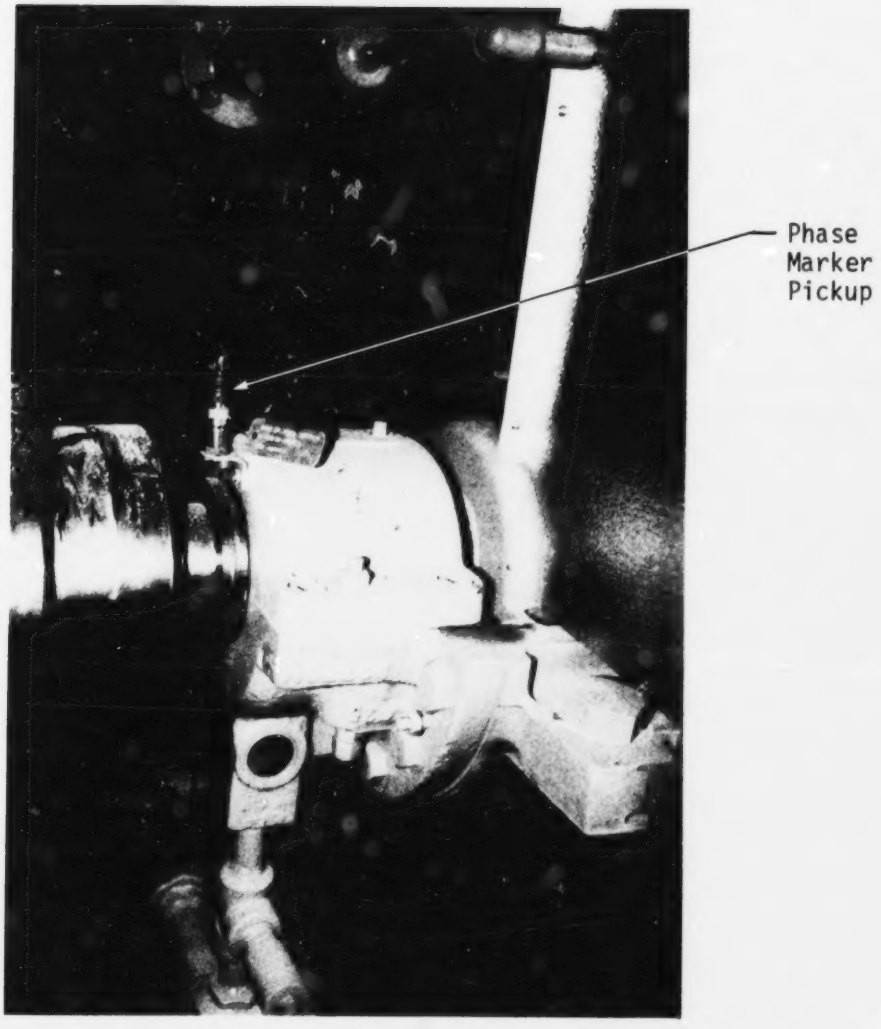
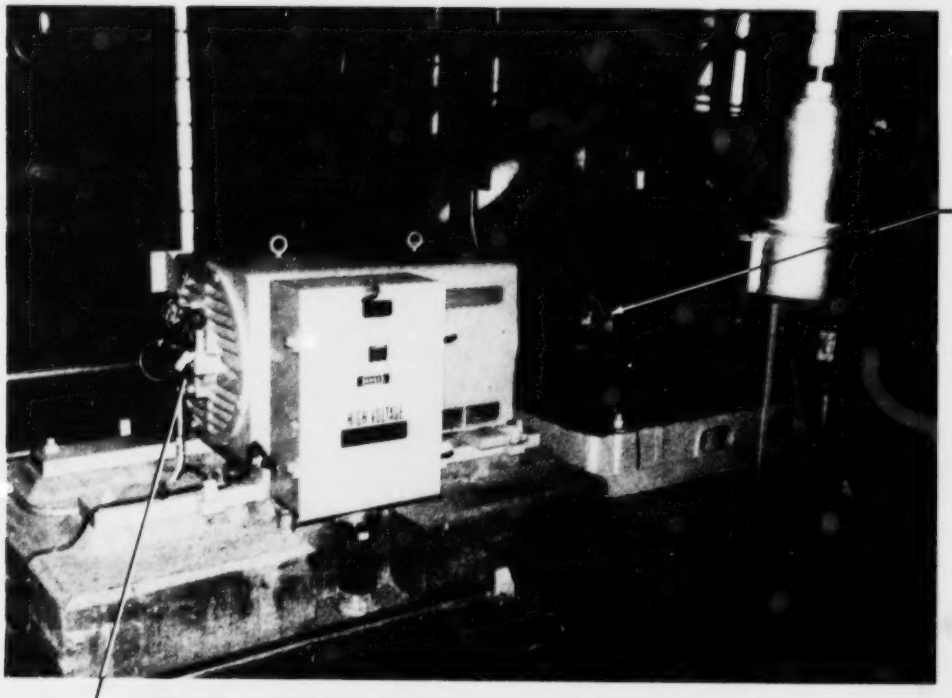


FIGURE 3
169397 RD

PICKERING NGS "B"
AUXILIARY BOILER FEED PUMP



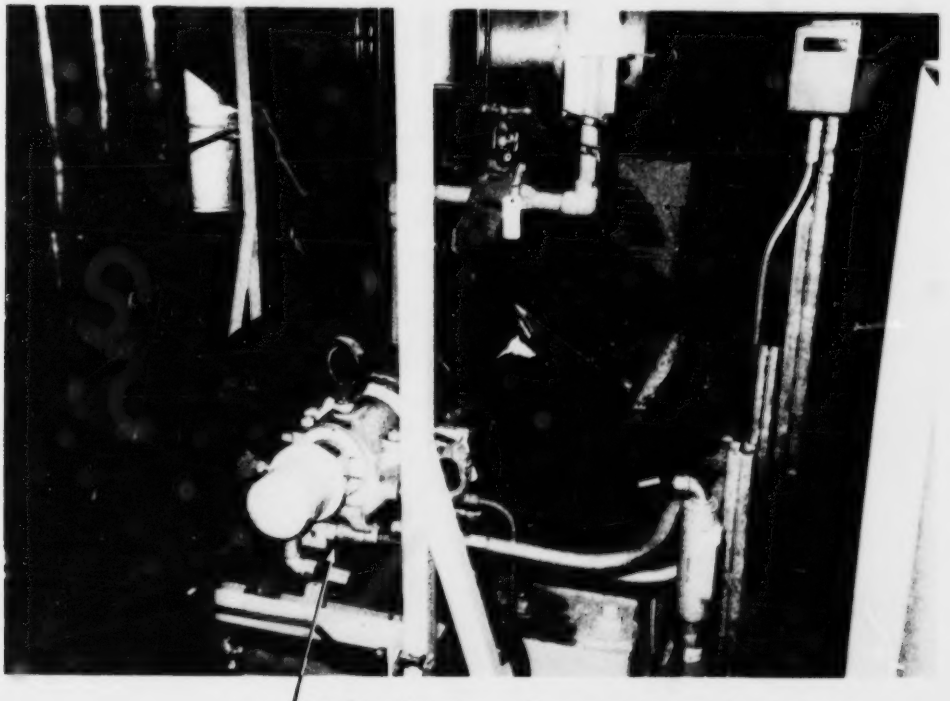


FIGURE 4
169398 RD

APPENDIX A

Compliance Transfer Function (Impact Spectra)
Main Boiler Feed Pumpsets

Pump	Fig No	Description	Frequency Range (Hz)
6	A1	Pump O/B Bearing - Horiz	1-500
	A2	Pump O/B Bearing - Vert	1-500
	A3	Pump O/B Bearing - Axial	1-500
	A4	Pump I/B Bearing - Horiz	1-500
	A5	Pump I/B Bearing - Vert	1-500
	A6	Pump I/B Bearing - Axial	1-200
	A7	Motor I/B Bearing - Horiz	1-500
	A8	Motor I/B Bearing - Vert	1-500
	A9	Motor I/B Bearing - Axial	1-500
	A10	Motor O/B Bearing - Horiz	1-500
	A11	Motor O/B Bearing - Vert	1-500
	A12	Motor O/B Bearing - Axial	1-500
7	A13	Pump O/B Bearing - Horiz	1-500
	A14	Pump O/B Bearing - Vert	1-500
	A15	Pump O/B Bearing - Axial	1-500
	A16	Pump I/B Bearing - Horiz	1-500
	A17	Pump I/B Bearing - Vert	1-500
	A18	Pump I/B Bearing - Axial	1-500
	A19	Motor I/B Bearing - Horiz	1-500
	A20	Coherence Bearing - Horiz	1-500
	A21	Motor I/B Bearing - Vert	1-500
	A22	Motor I/B Bearing - Axial	1-500
	A23	Motor O/B Bearing - Horiz	1-500
	A24	Motor O/B Bearing - Vert	1-500
	A25	Motor O/B Bearing - Axial	1-500
8	A26	Pump O/B Bearing - Horiz	1-500
	A27	Pump O/B Bearing - Vert	1-500
	A28	Pump O/B Bearing - Axial	1-500
	A29	Pump I/B Bearing - Horiz	1-500
	A30	Pump I/B Bearing - Vert	1-500
	A31	Pump I/B Bearing - Axial	1-200
	A32	Motor I/B Bearing - Horiz	1-500
	A33	Motor I/B Bearing - Vert	1-500
	A34	Motor I/B Bearing - Axial	1-500
	A35	Motor O/B Bearing - Horiz	1-500
	A36	Motor O/B Bearing - Vert	1-500
	A37	Motor O/B Bearing - Axial	1-500

The vertical scales in the above figures are N/M.

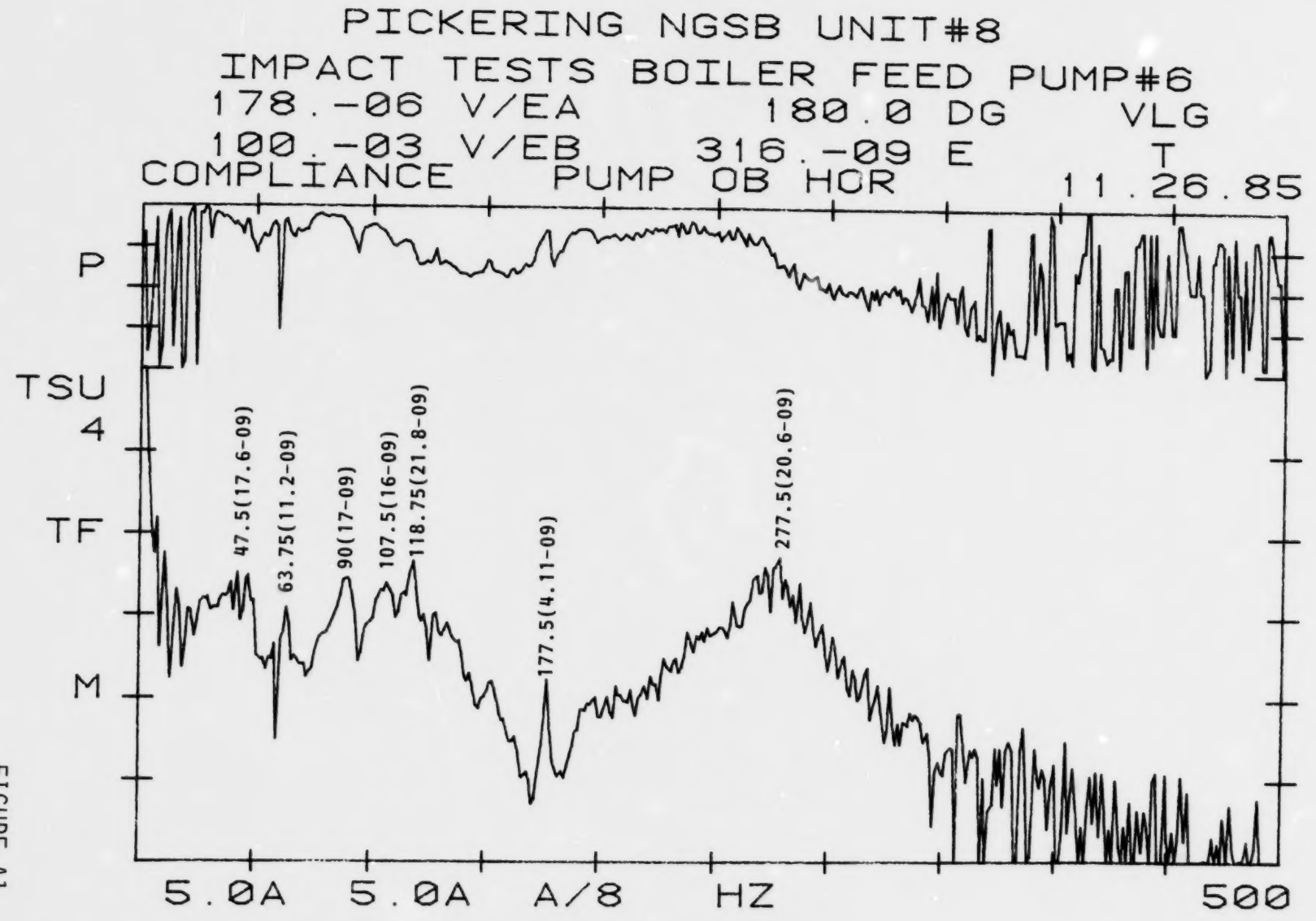

PICKERING NGSB UNIT#8
IMPACT TESTS BOILER FEED PUMP#6
178.-06 V/EA
180.0 DG
VLG
100.-03 V/EB
316.-09 E
T
COMPLIANCE
PUMP OB HOR
11.26.85
P
TSU
4
TF
M
47.5(17.6-09)
63.75(11.2-09)
90(17-09)
107.5(16-09)
118.75(21.8-09)
177.5(4.11-09)
277.5(20.6-09)
5.0A
5.0A
A/8
HZ
500

FIGURE A1

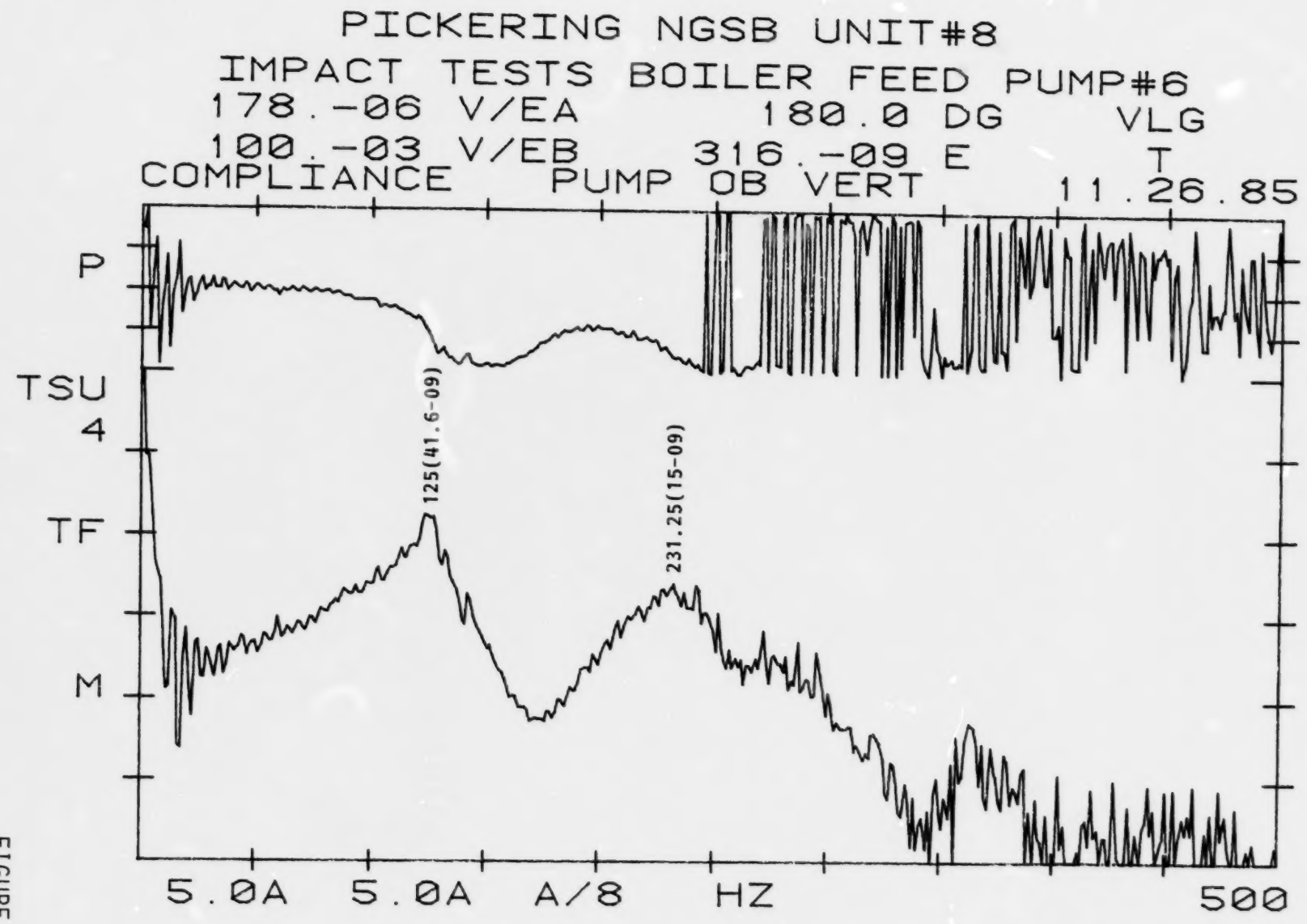


FIGURE A2
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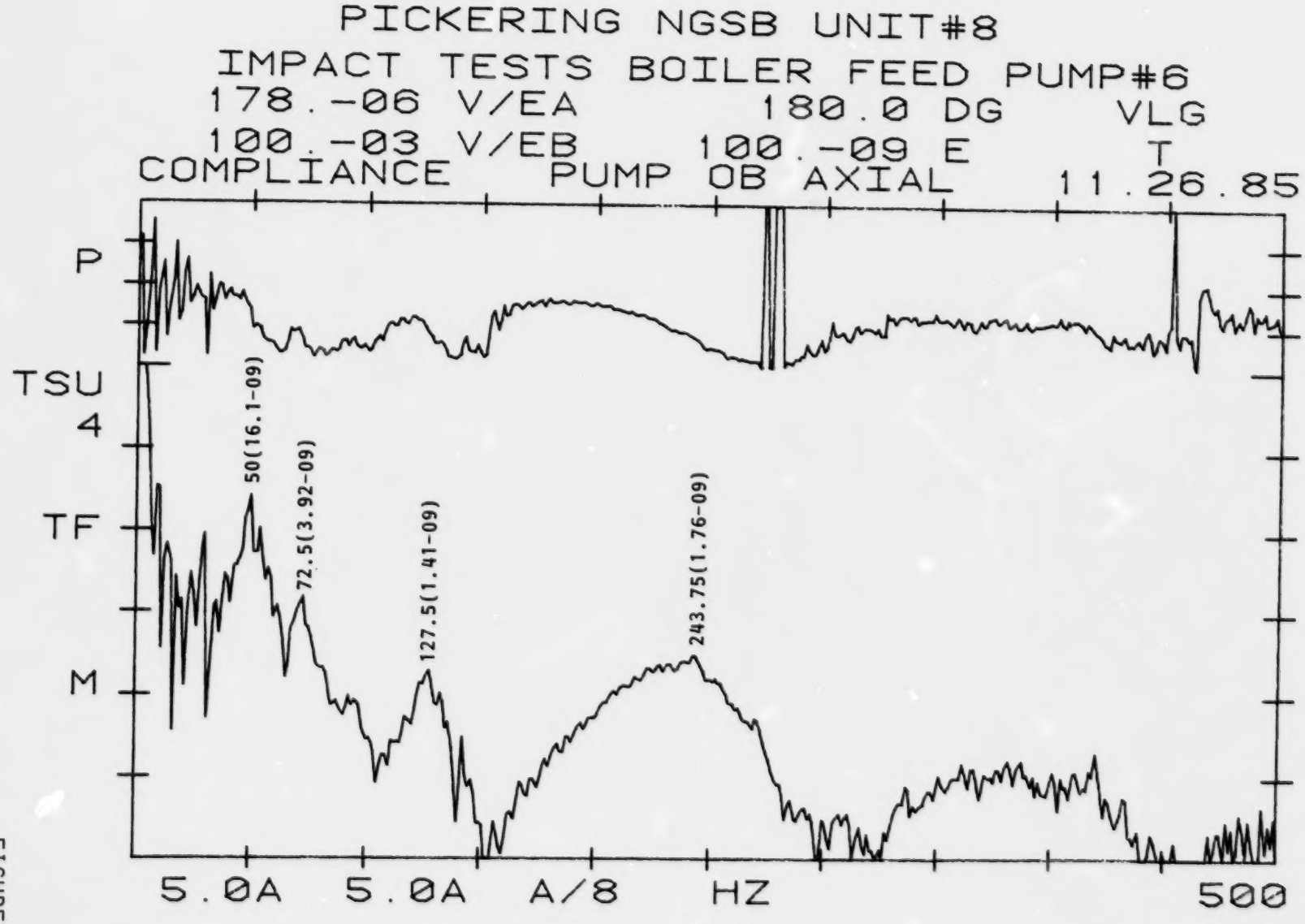

FIGURE A3
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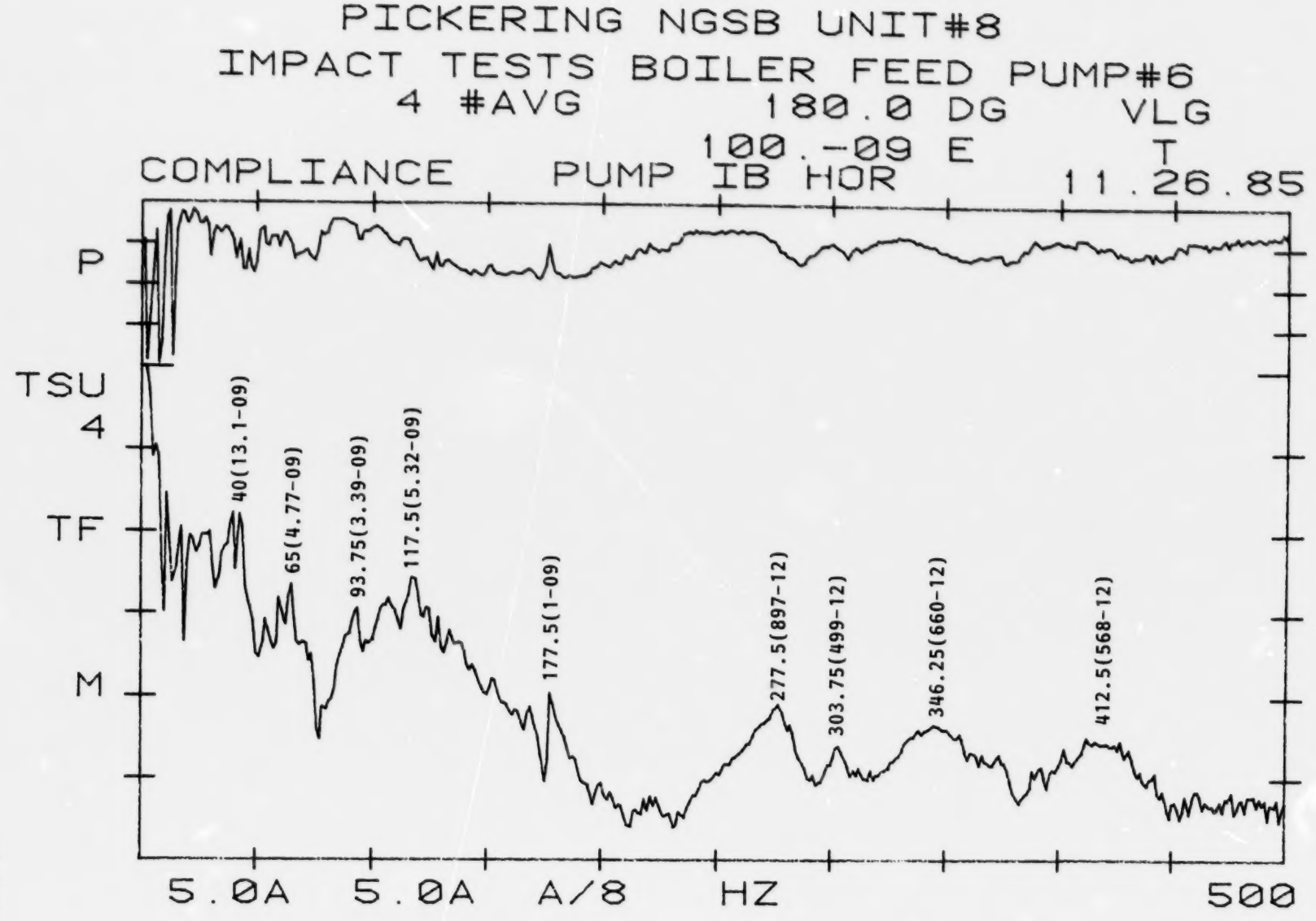

FIGURE A4
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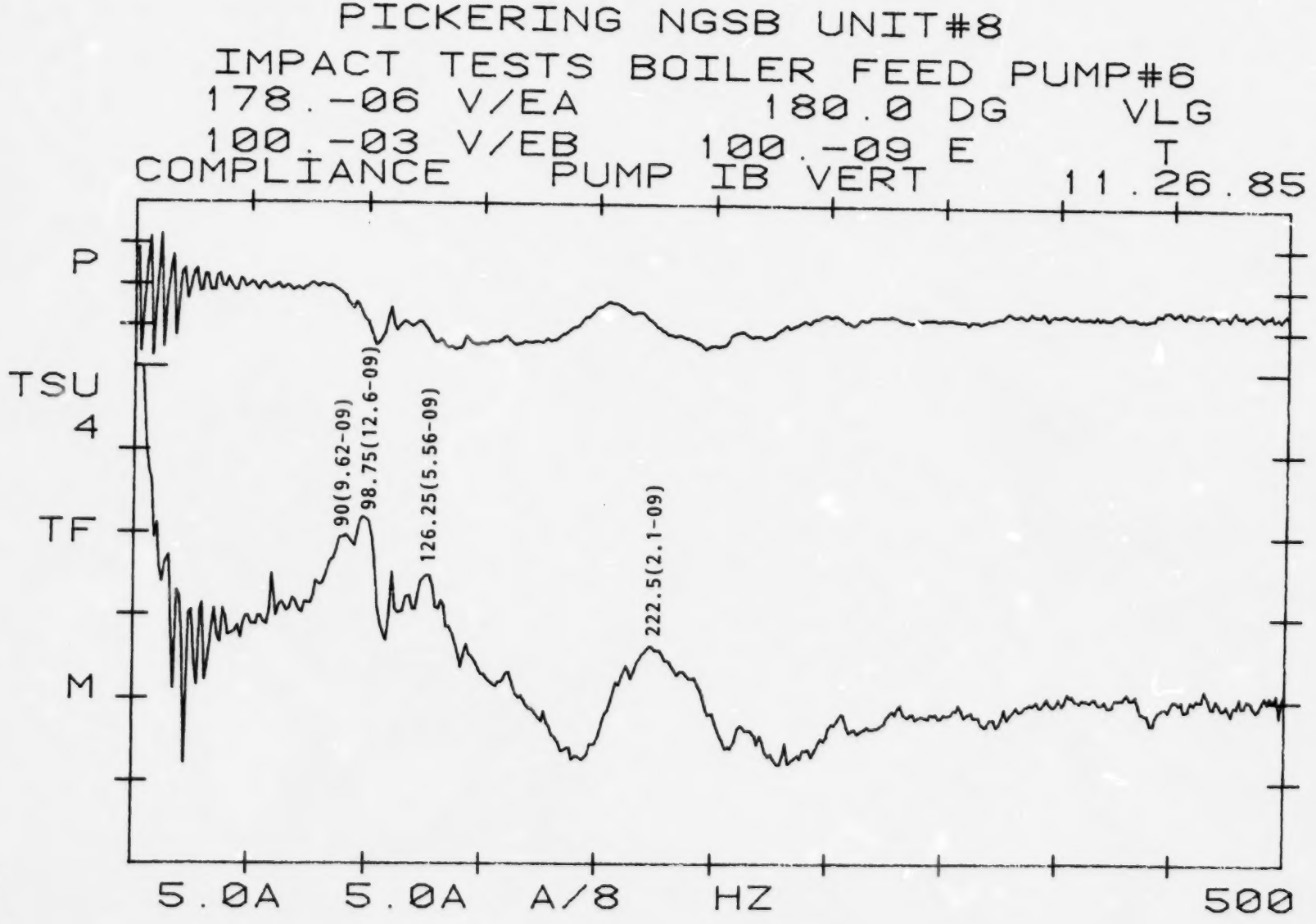

FIGURE A5
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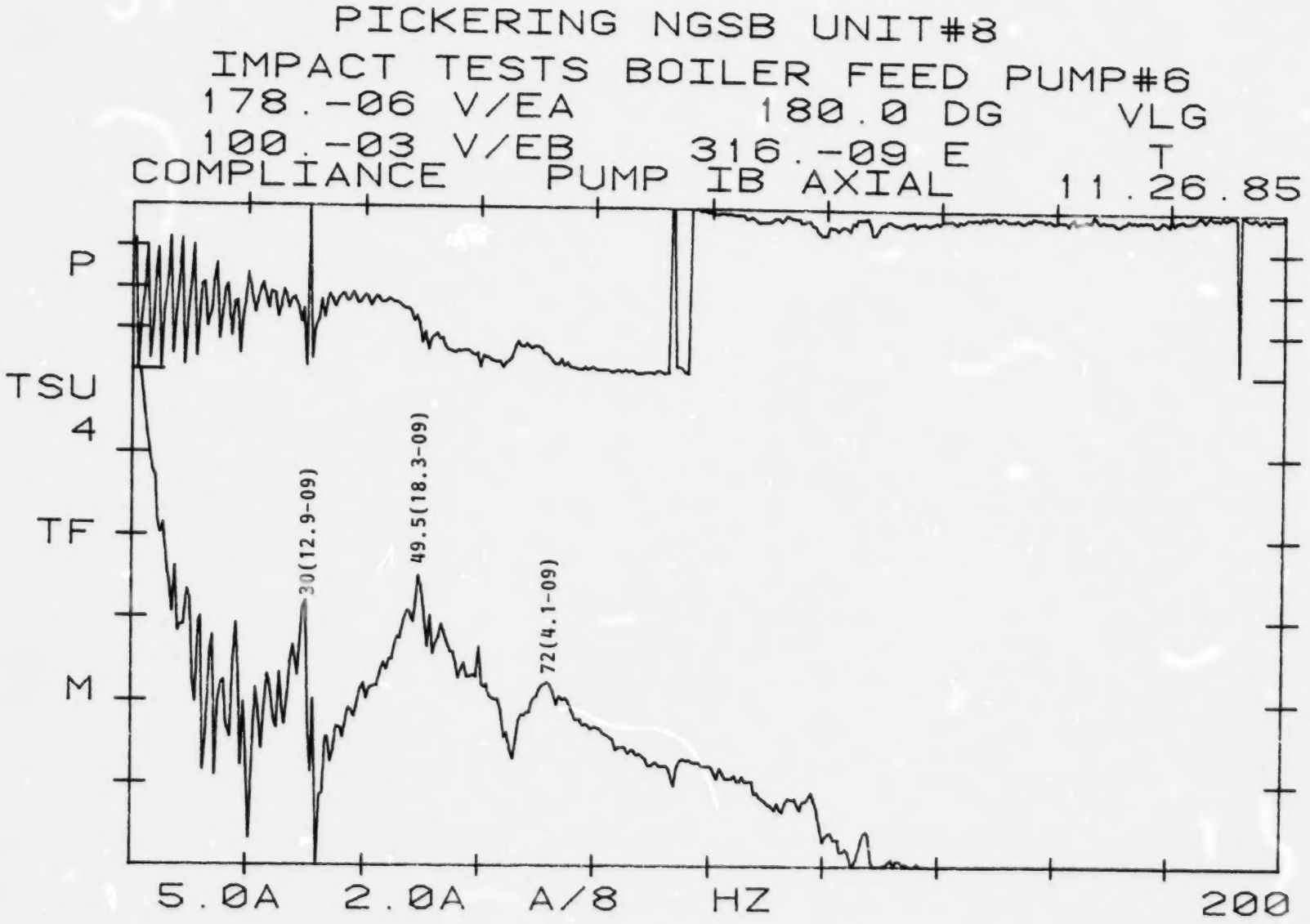

FIGURE A6

86-335

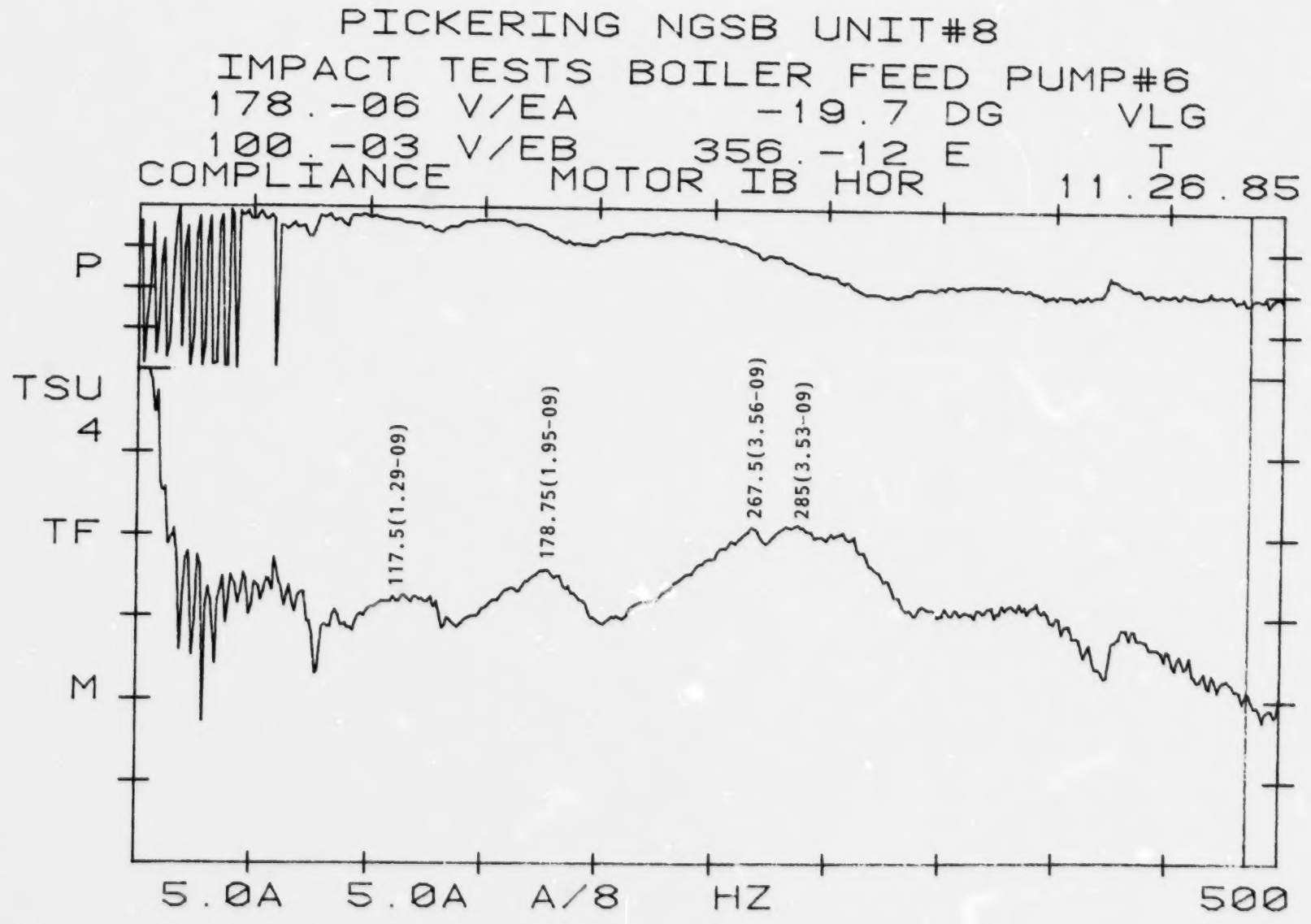

FIGURE A7
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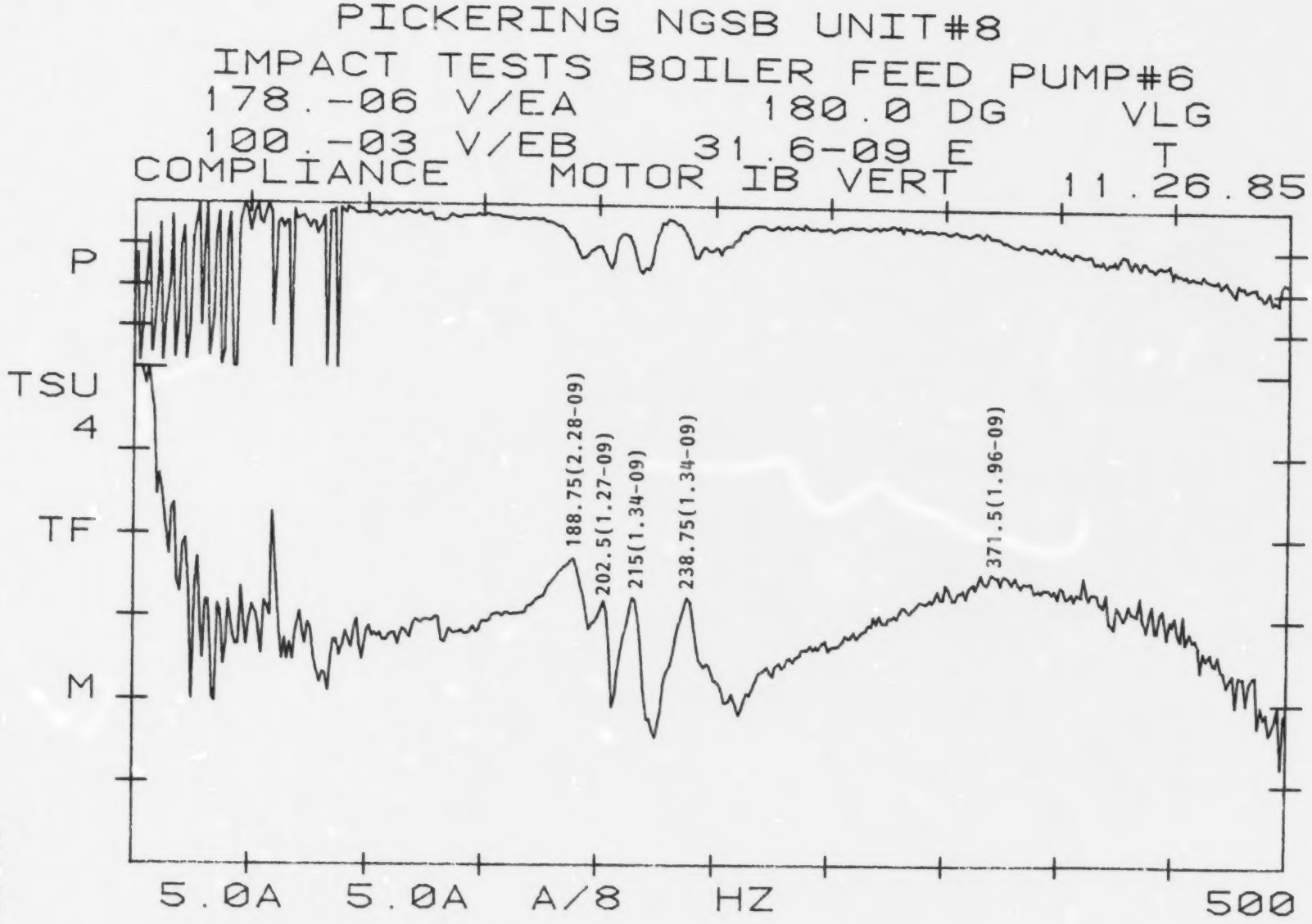

FIGURE A8
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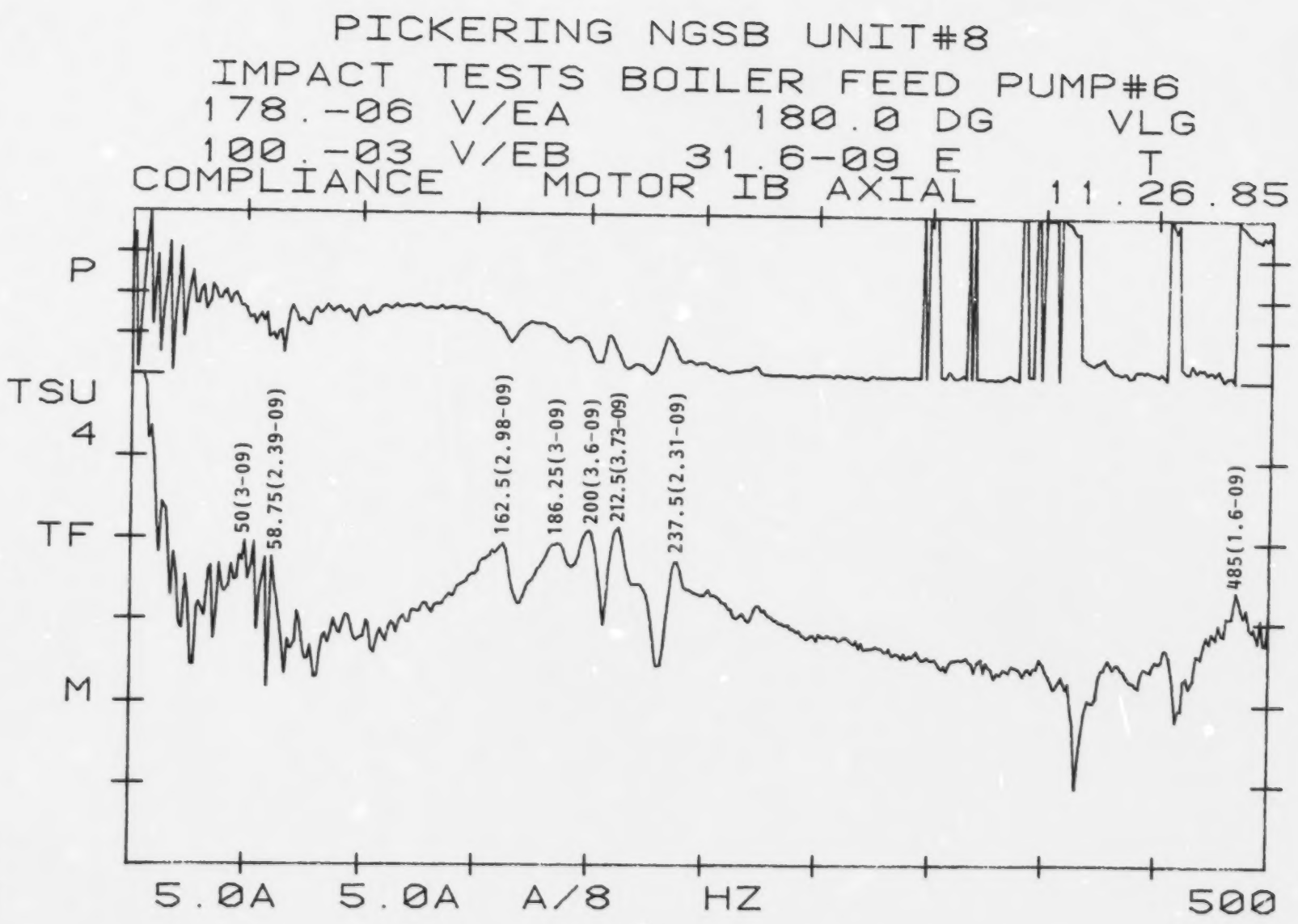

FIGURE A9
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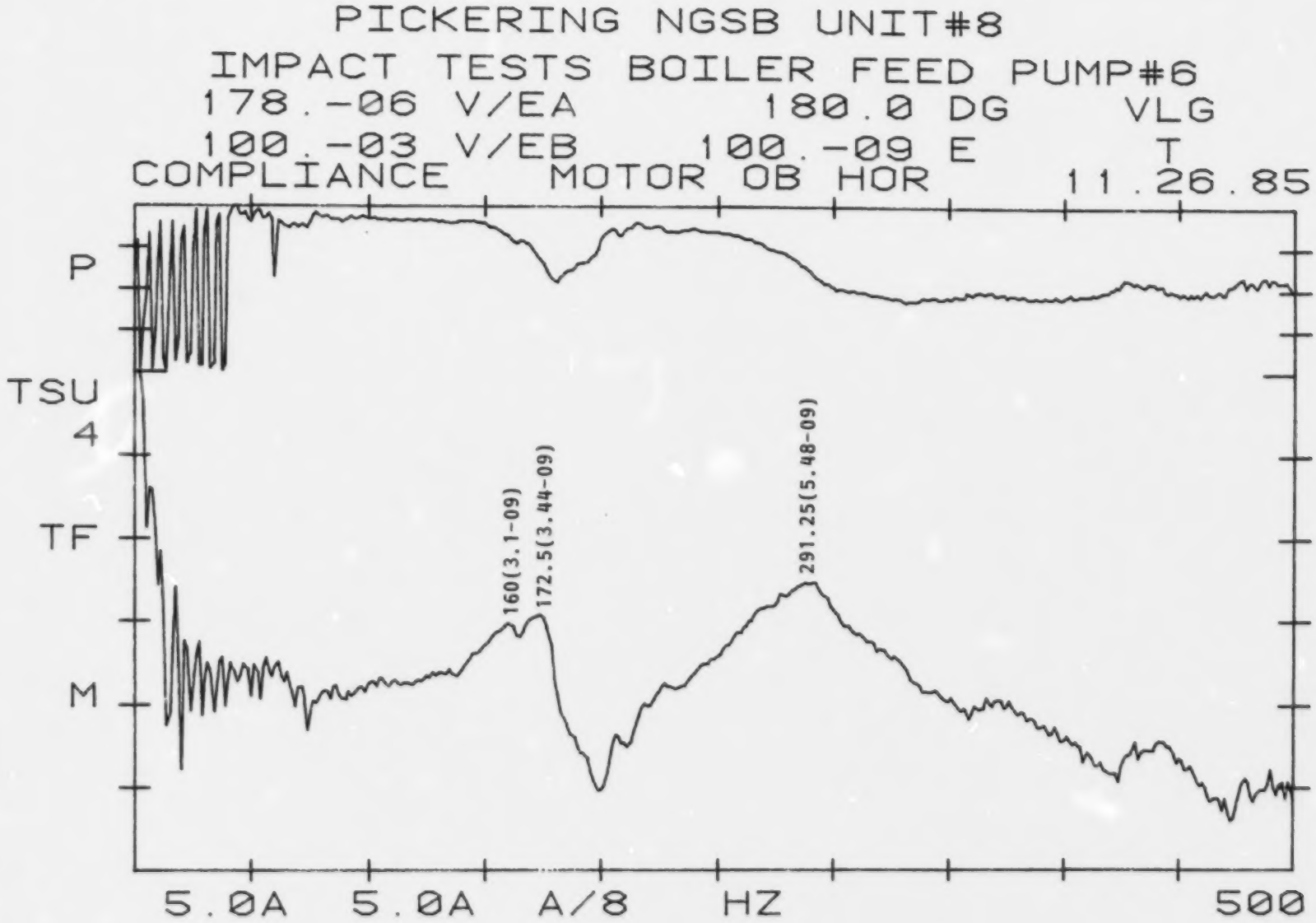

FIGURE A10
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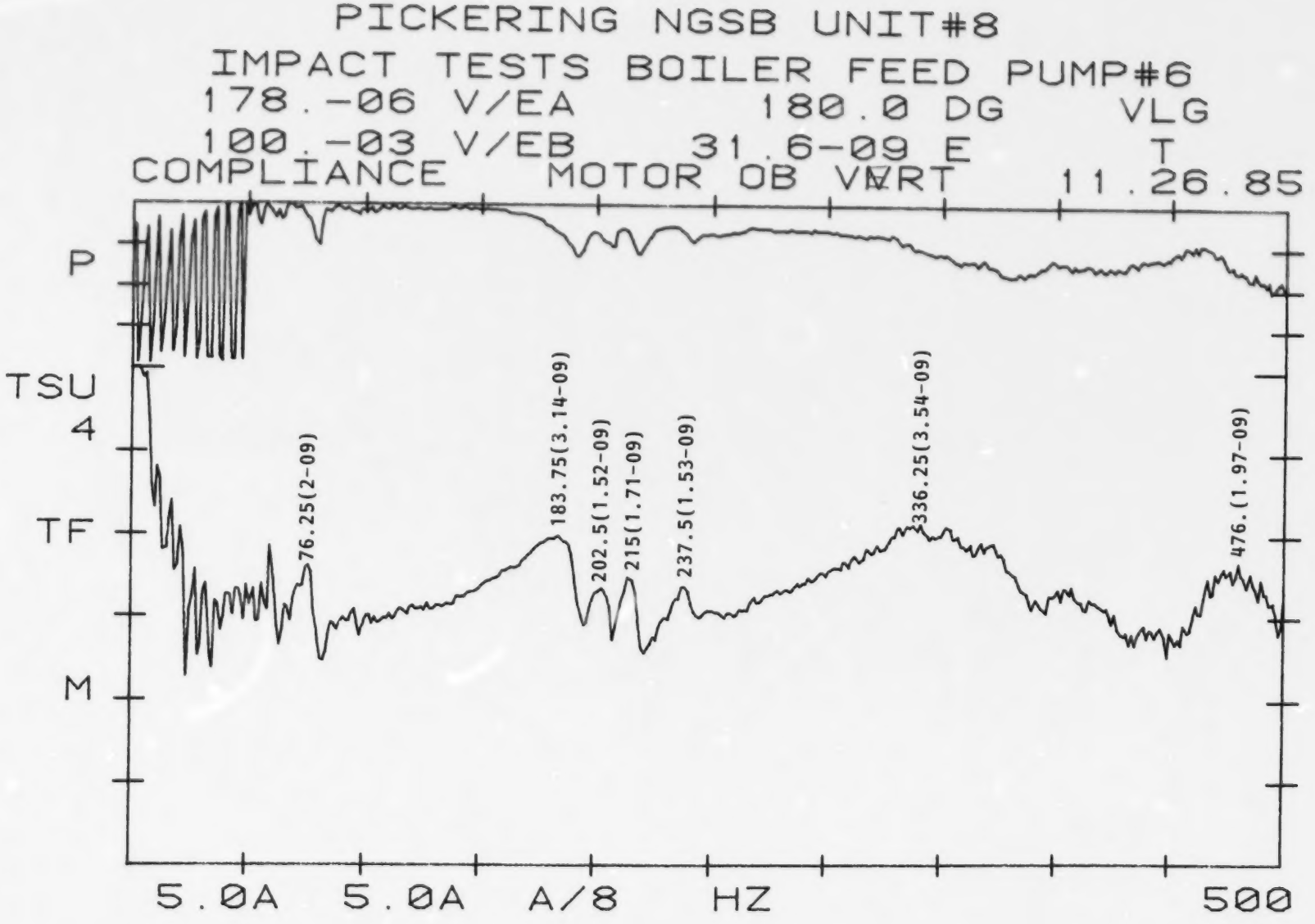

FIGURE A11
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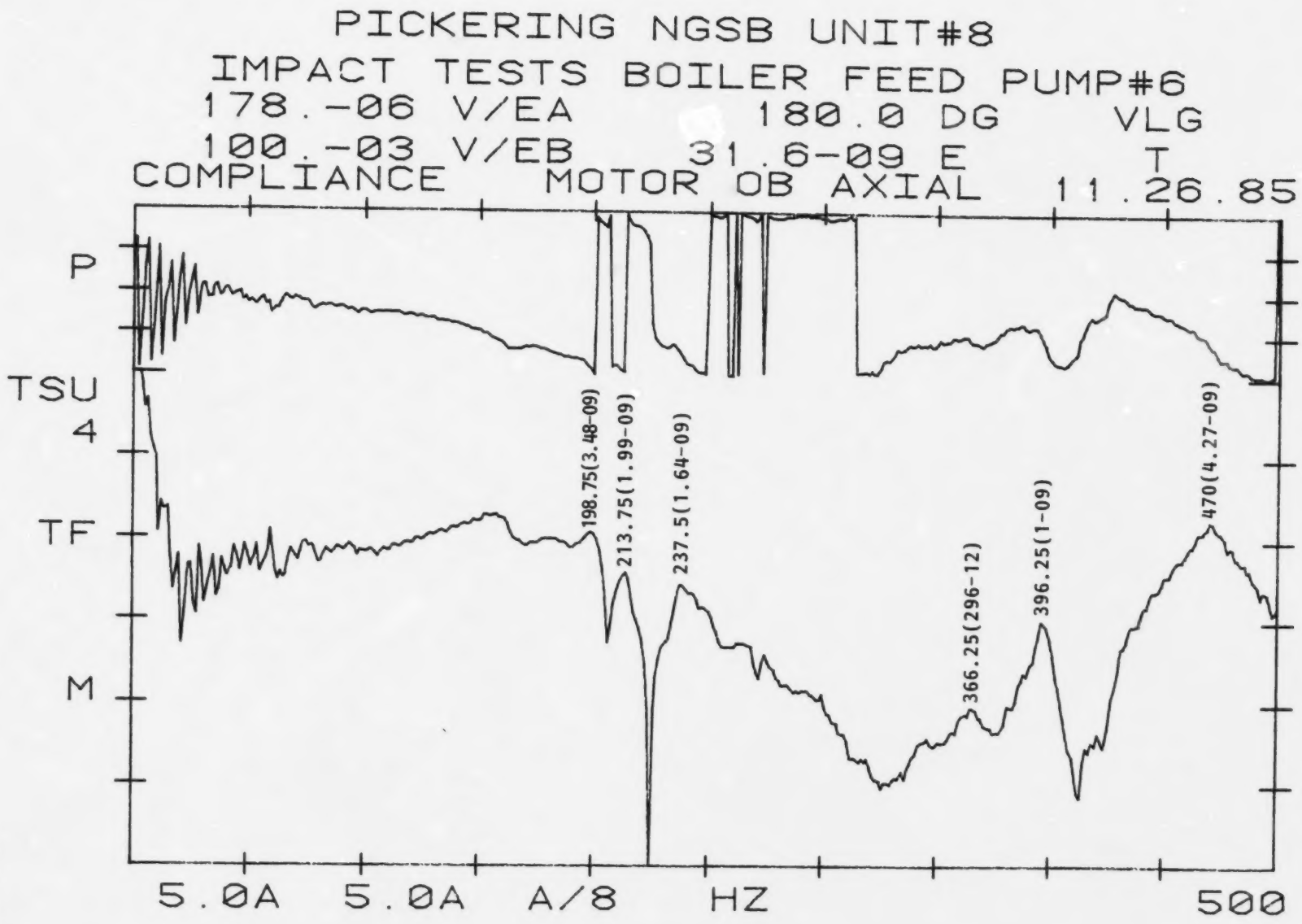

FIGURE A12

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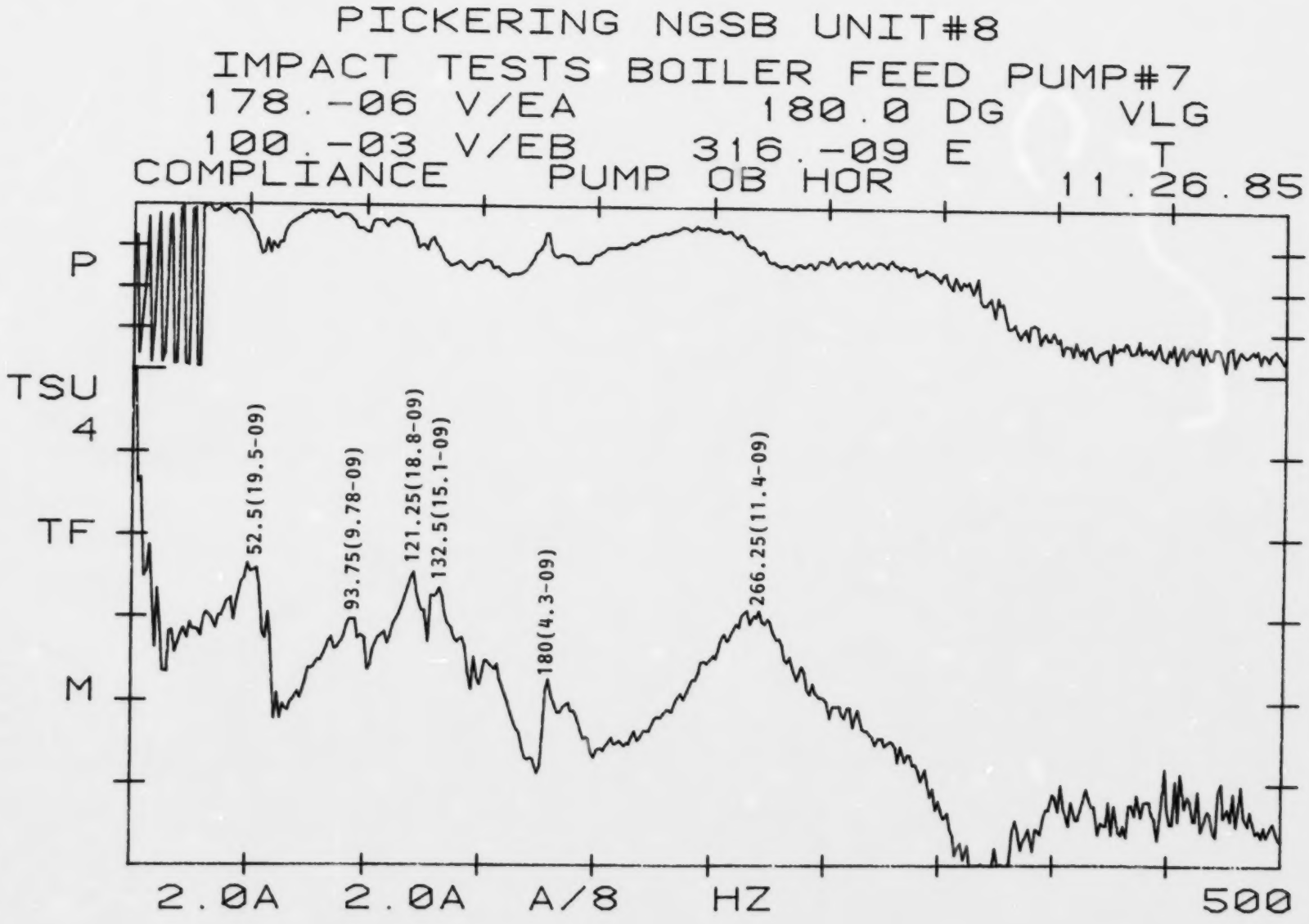

FIGURE A13
86-335

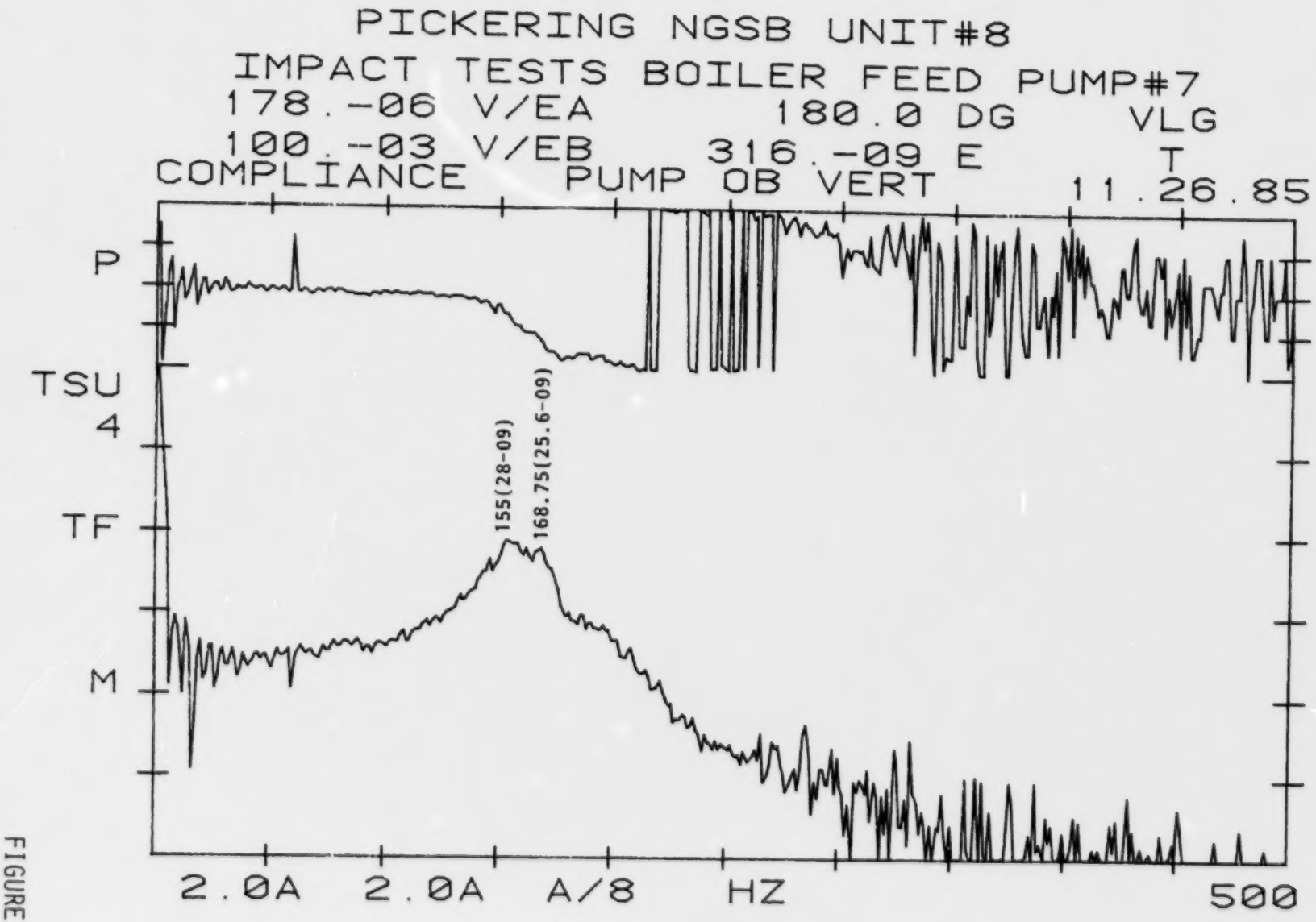

FIGURE A14
86-335

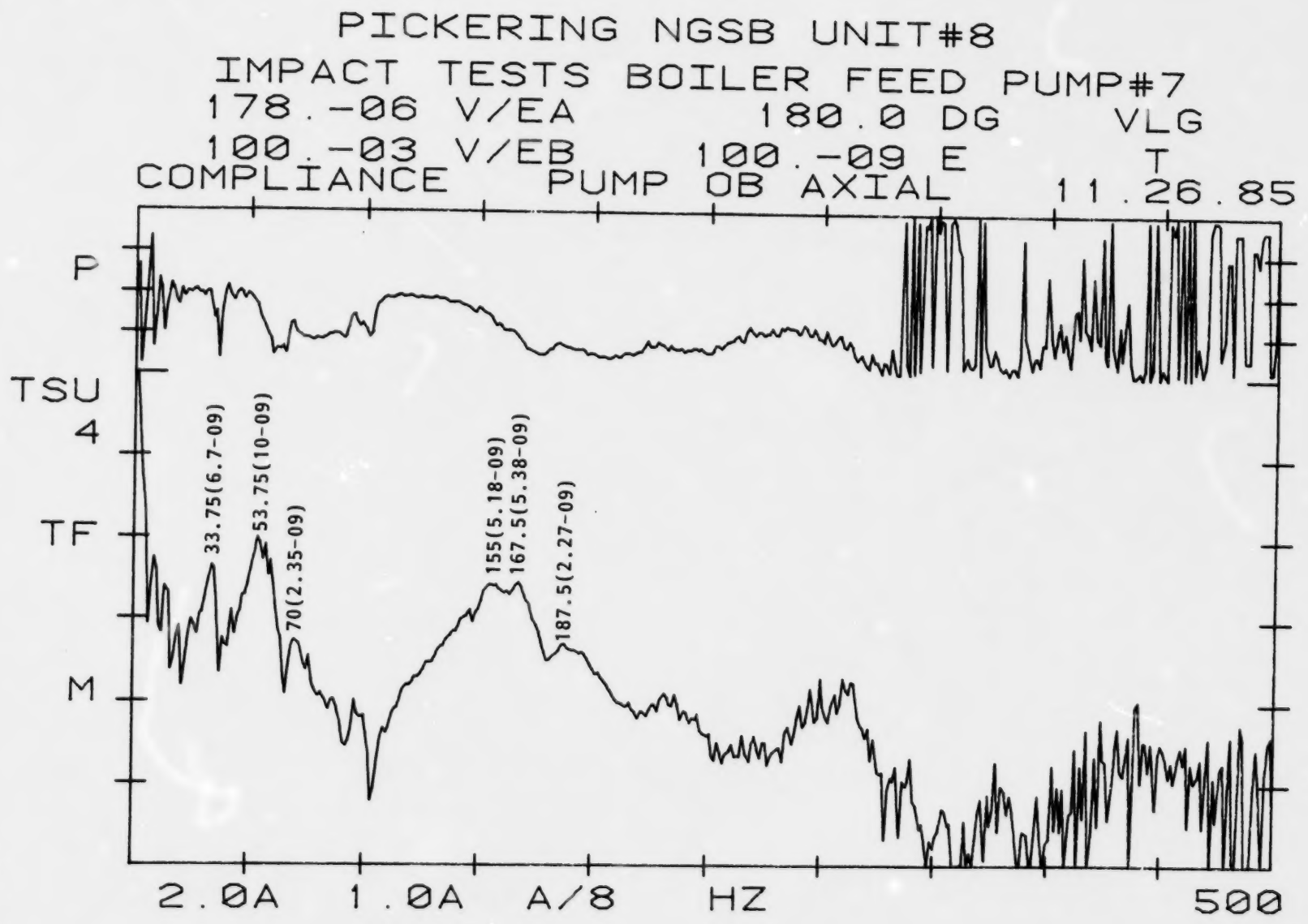

FIGURE A15
86-335

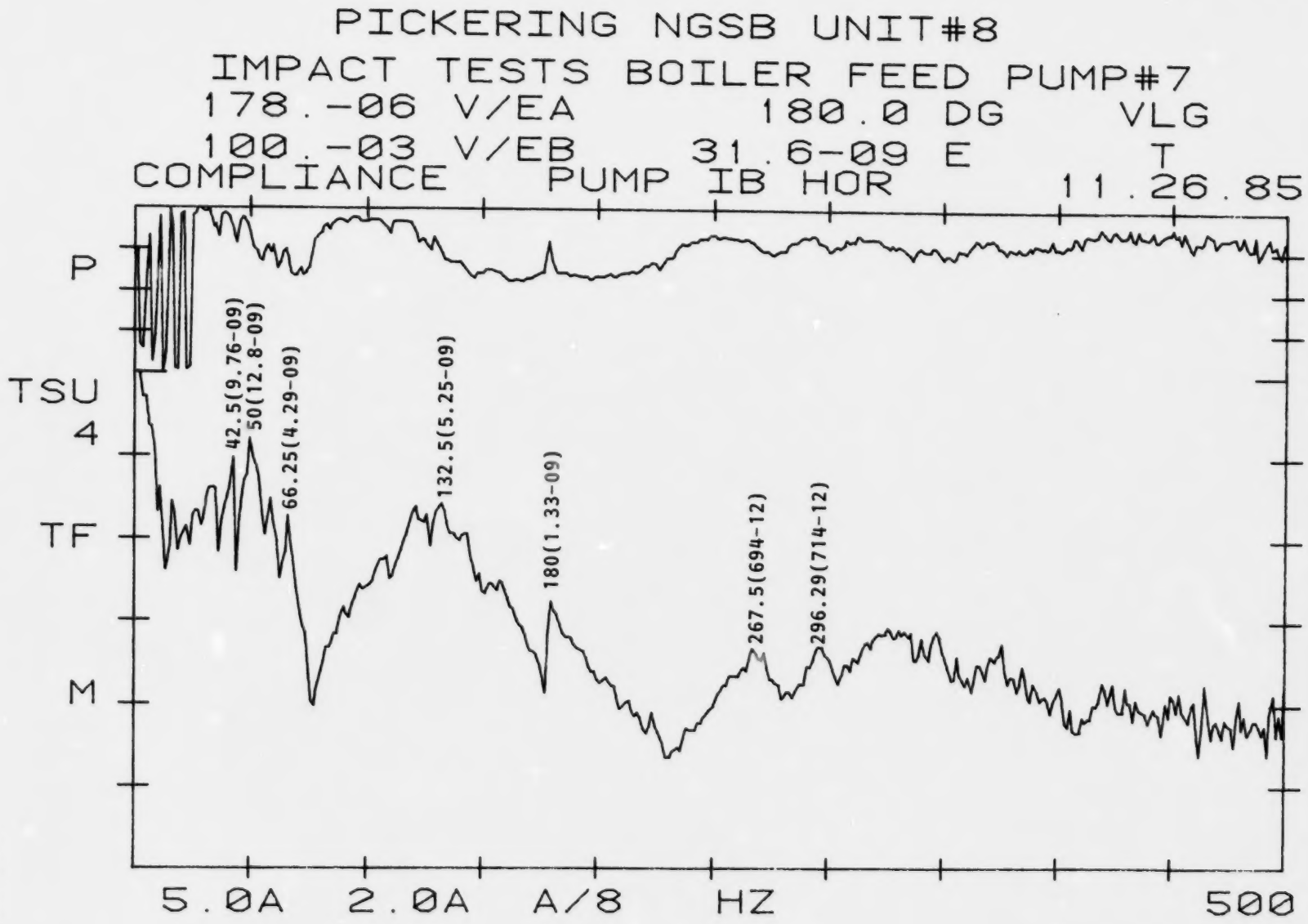

FIGURE A16
86-335

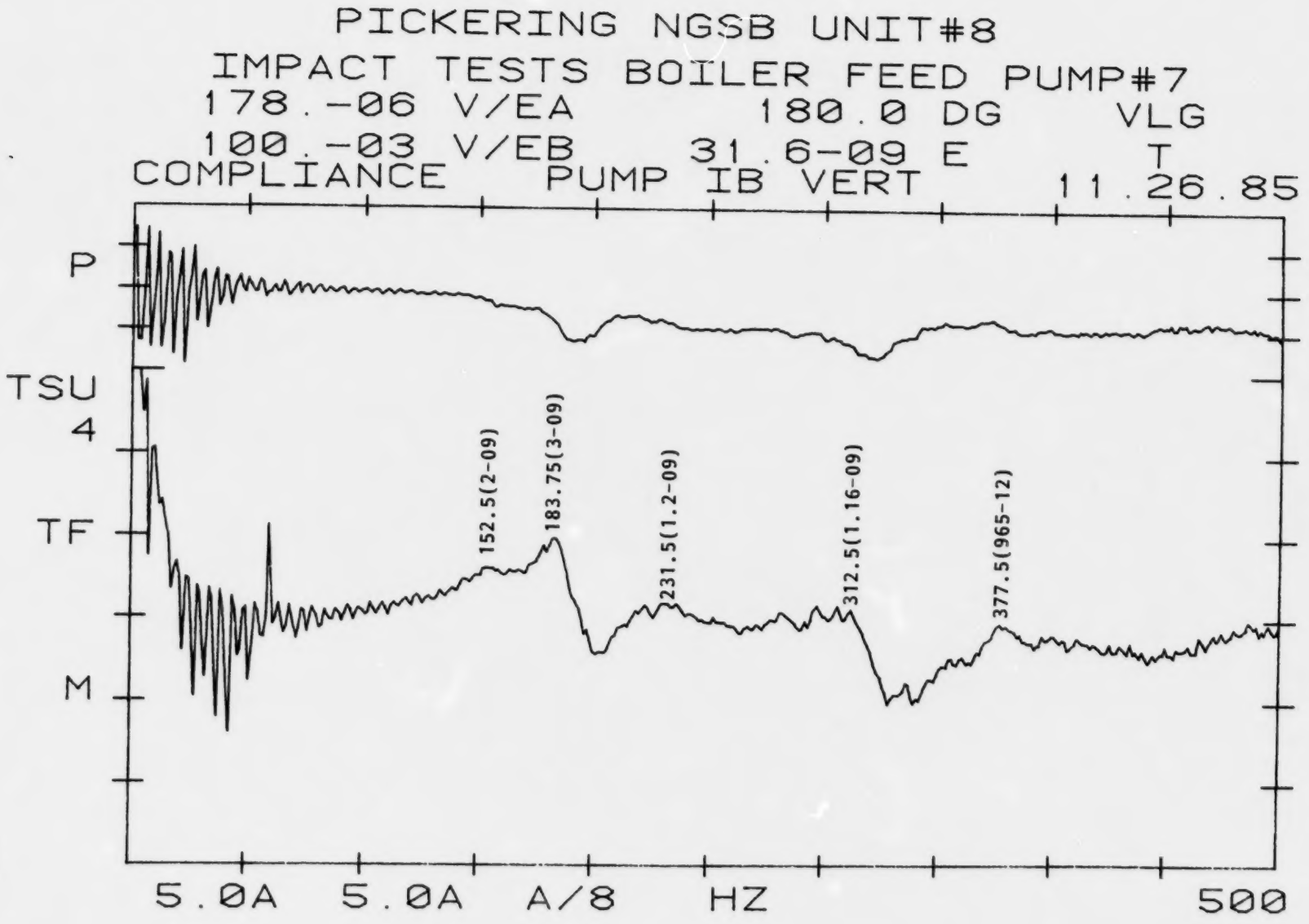

FIGURE A17
86-335

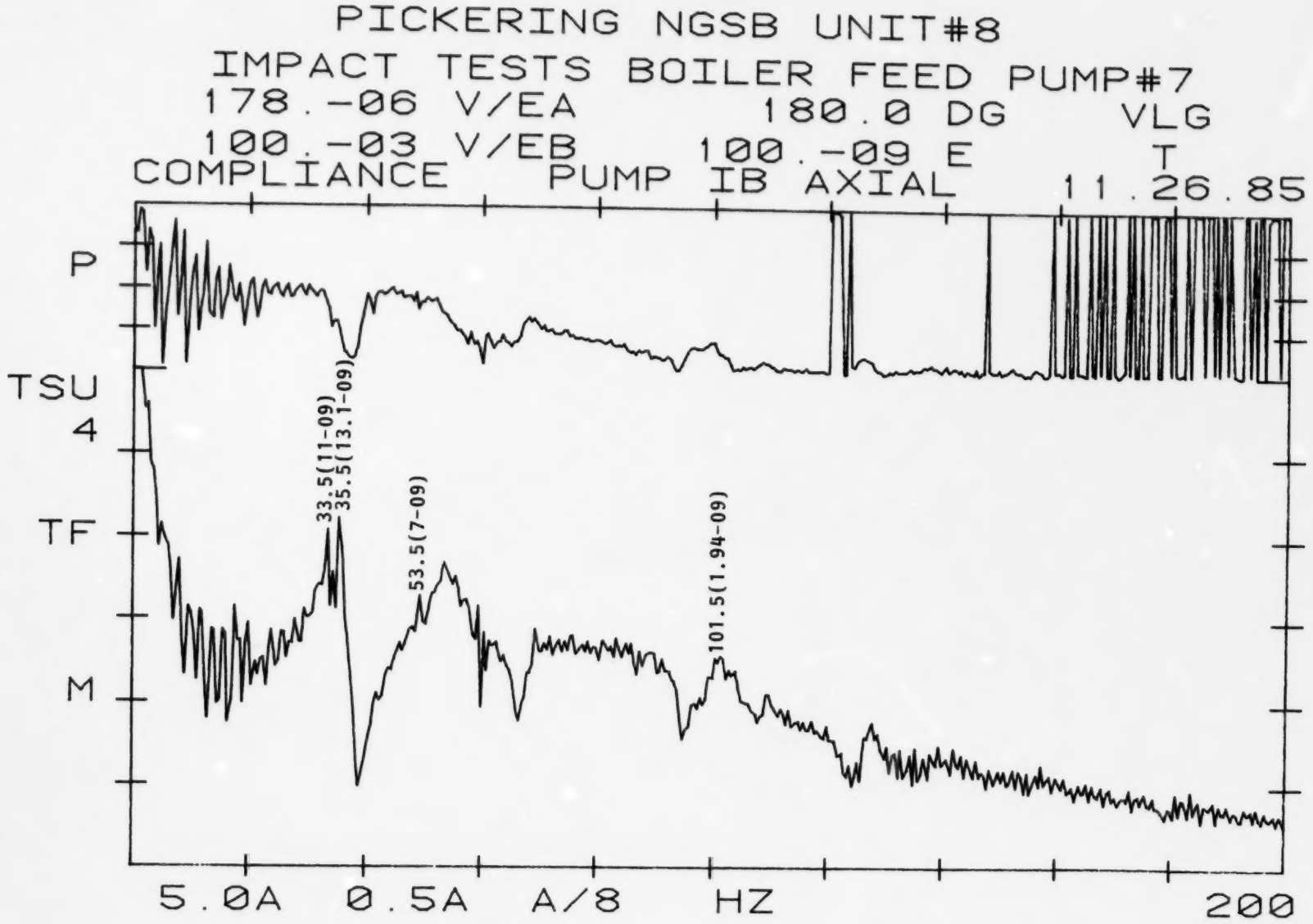

FIGURE A18
86-335

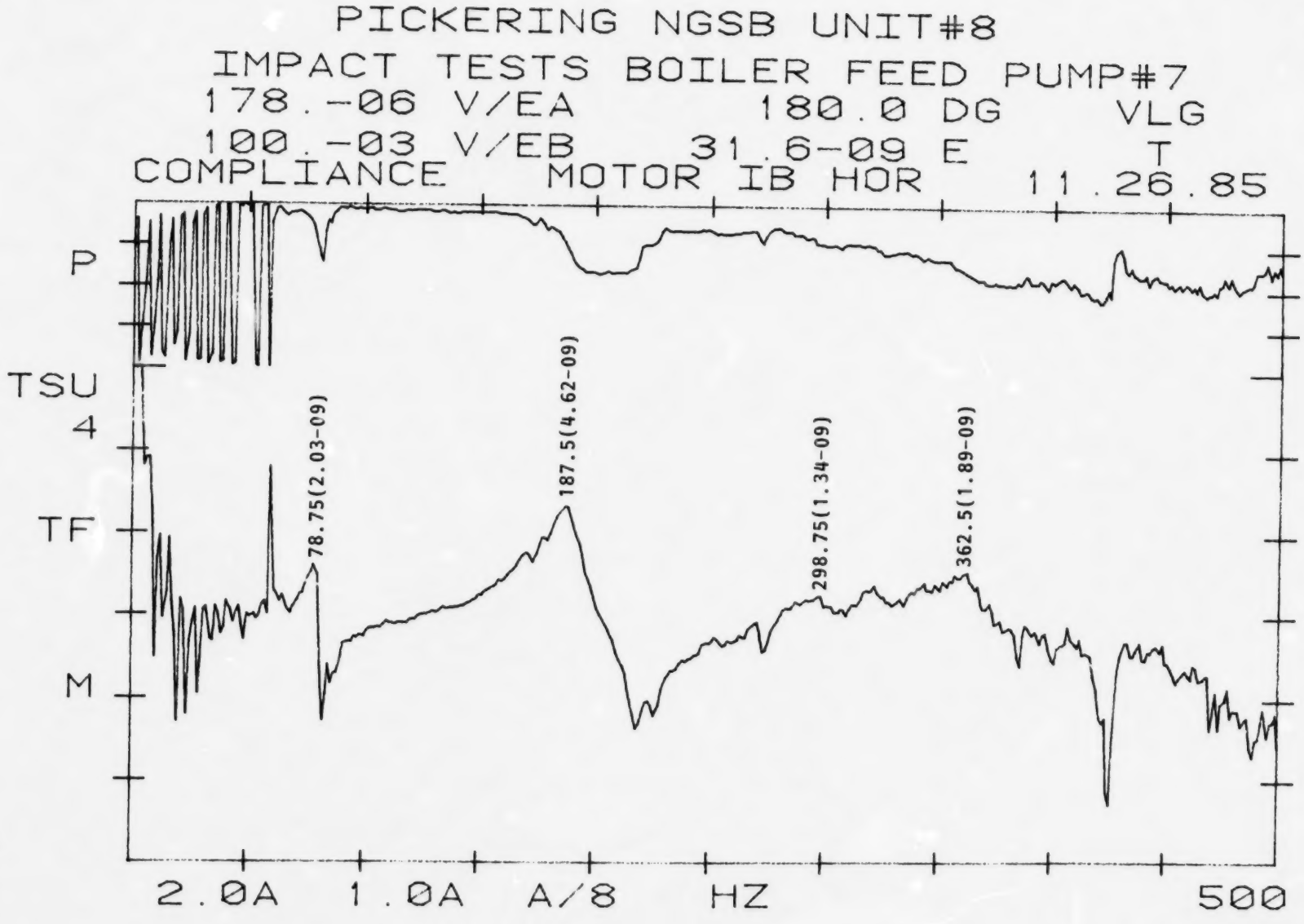

FIGURE A19
86-335

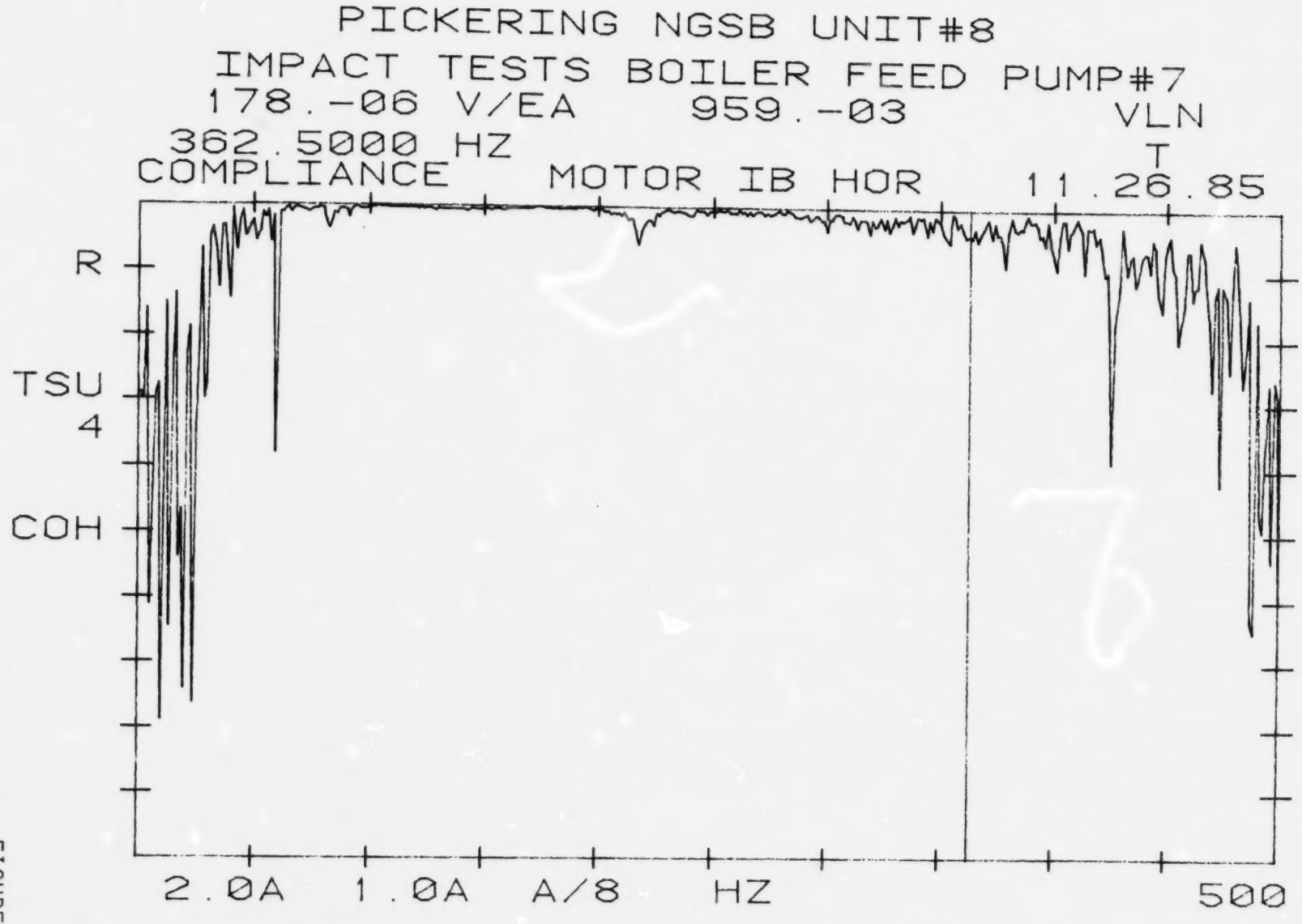

FIGURE A20

86-335

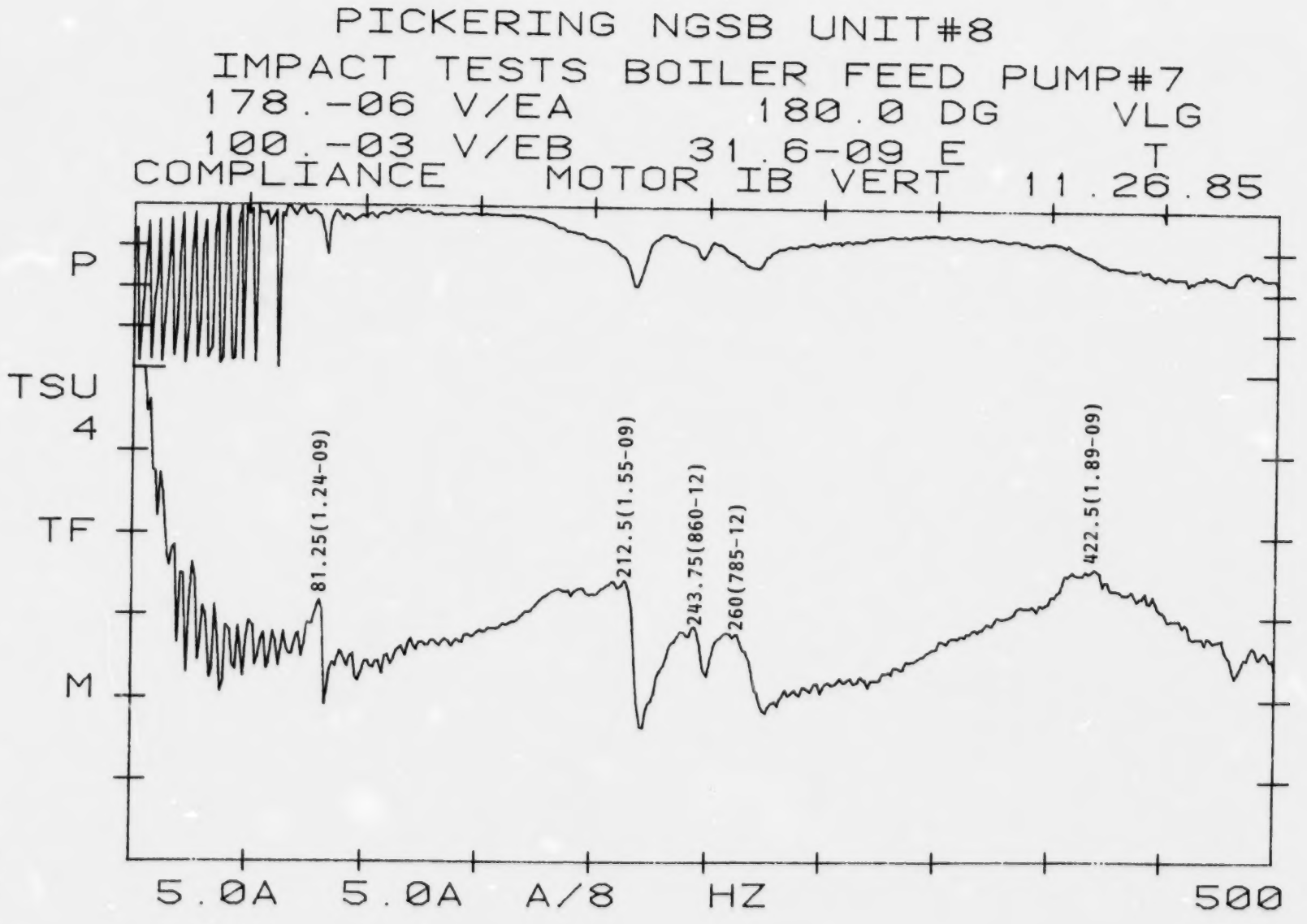

FIGURE A21
86-335

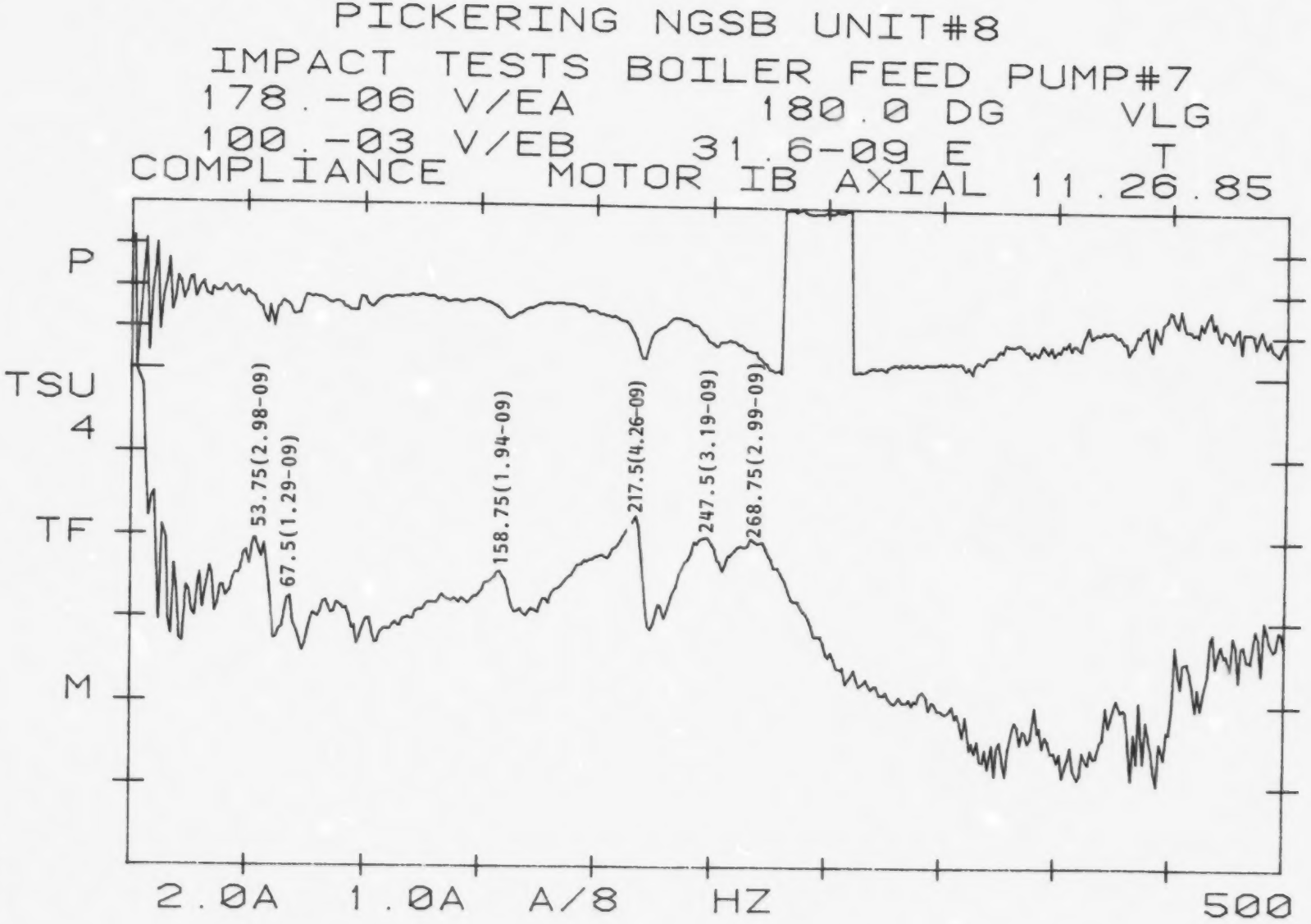

FIGURE A22
86-335

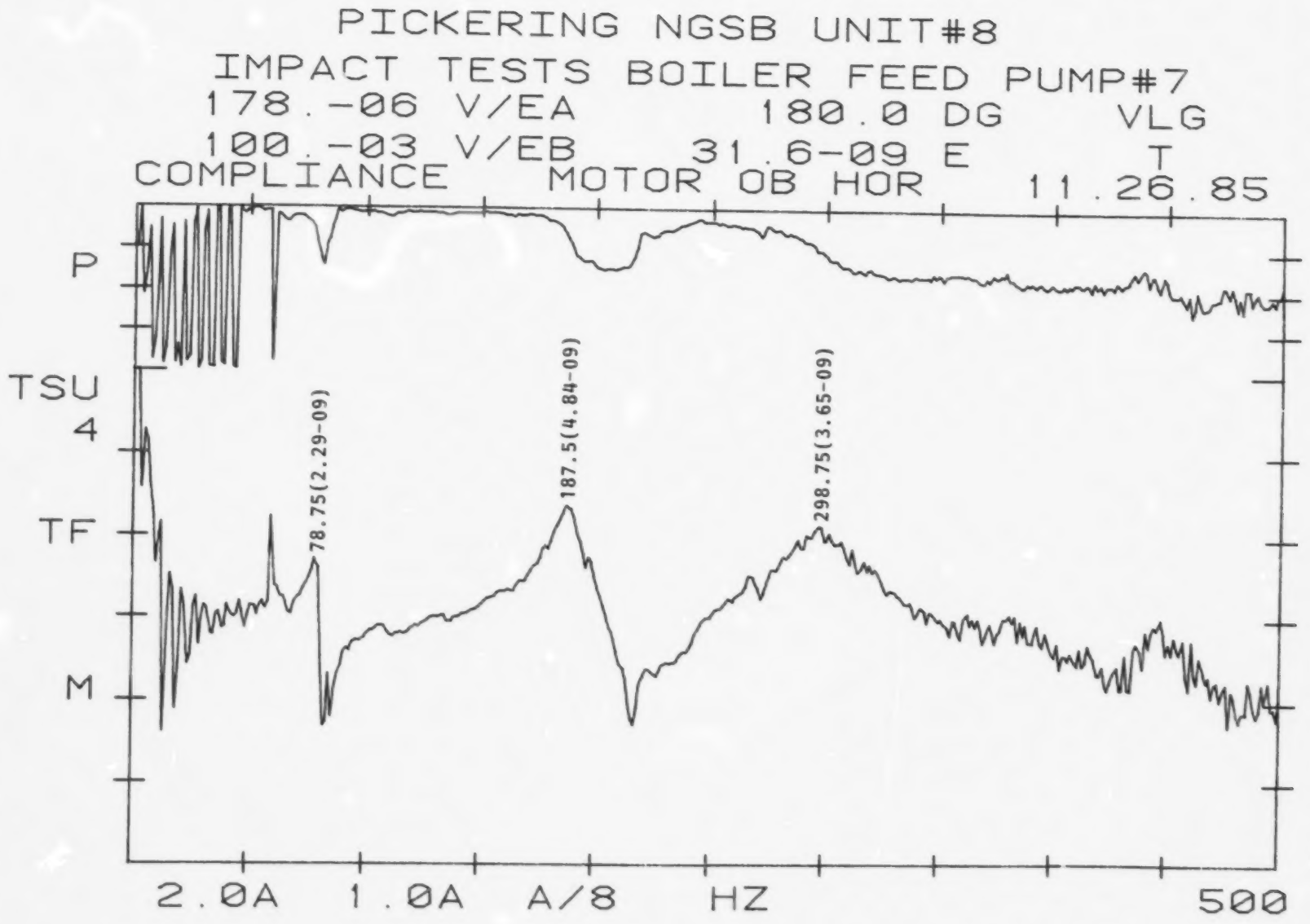

FIGURE A23
86-335

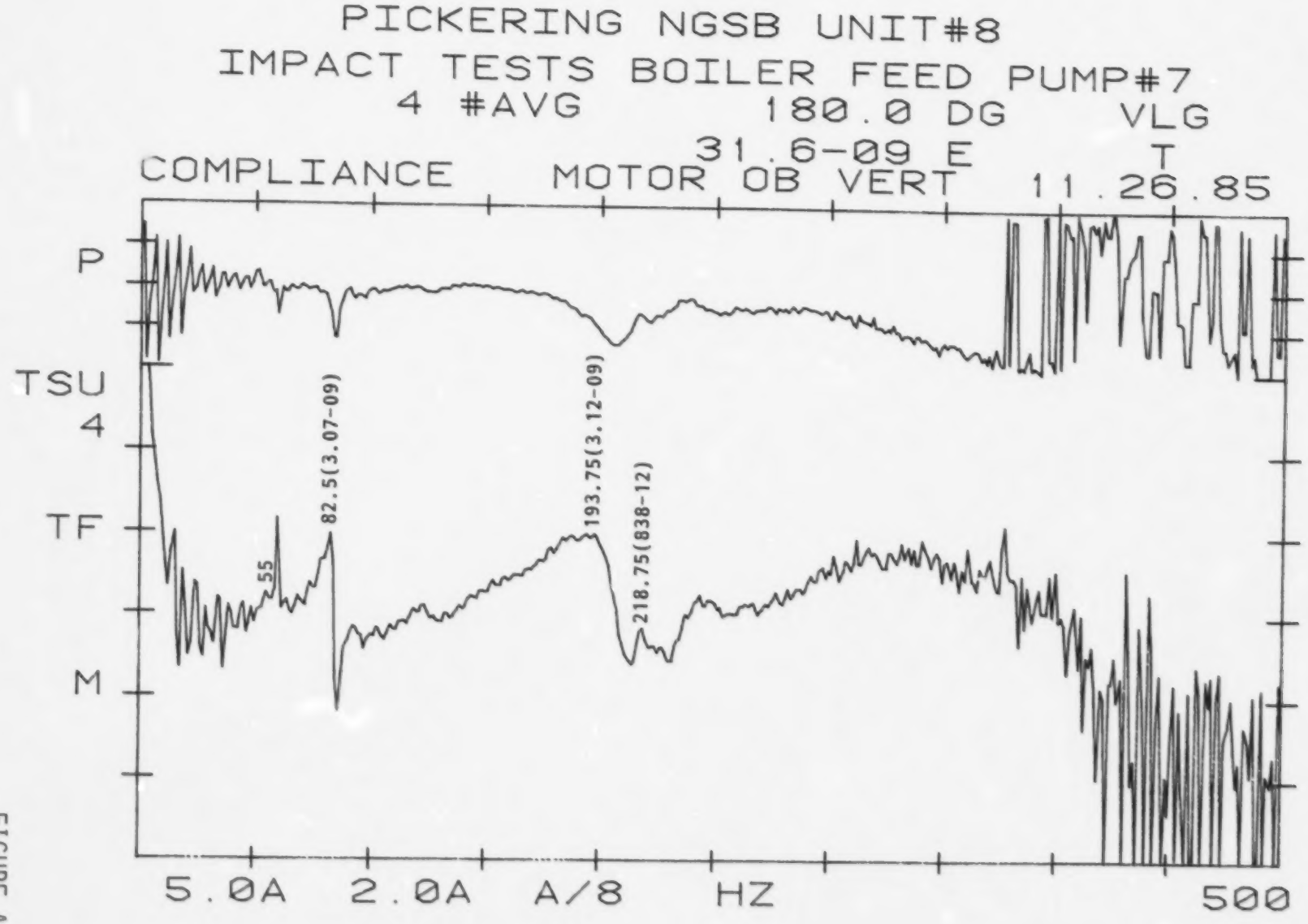

FIGURE A24
86-335

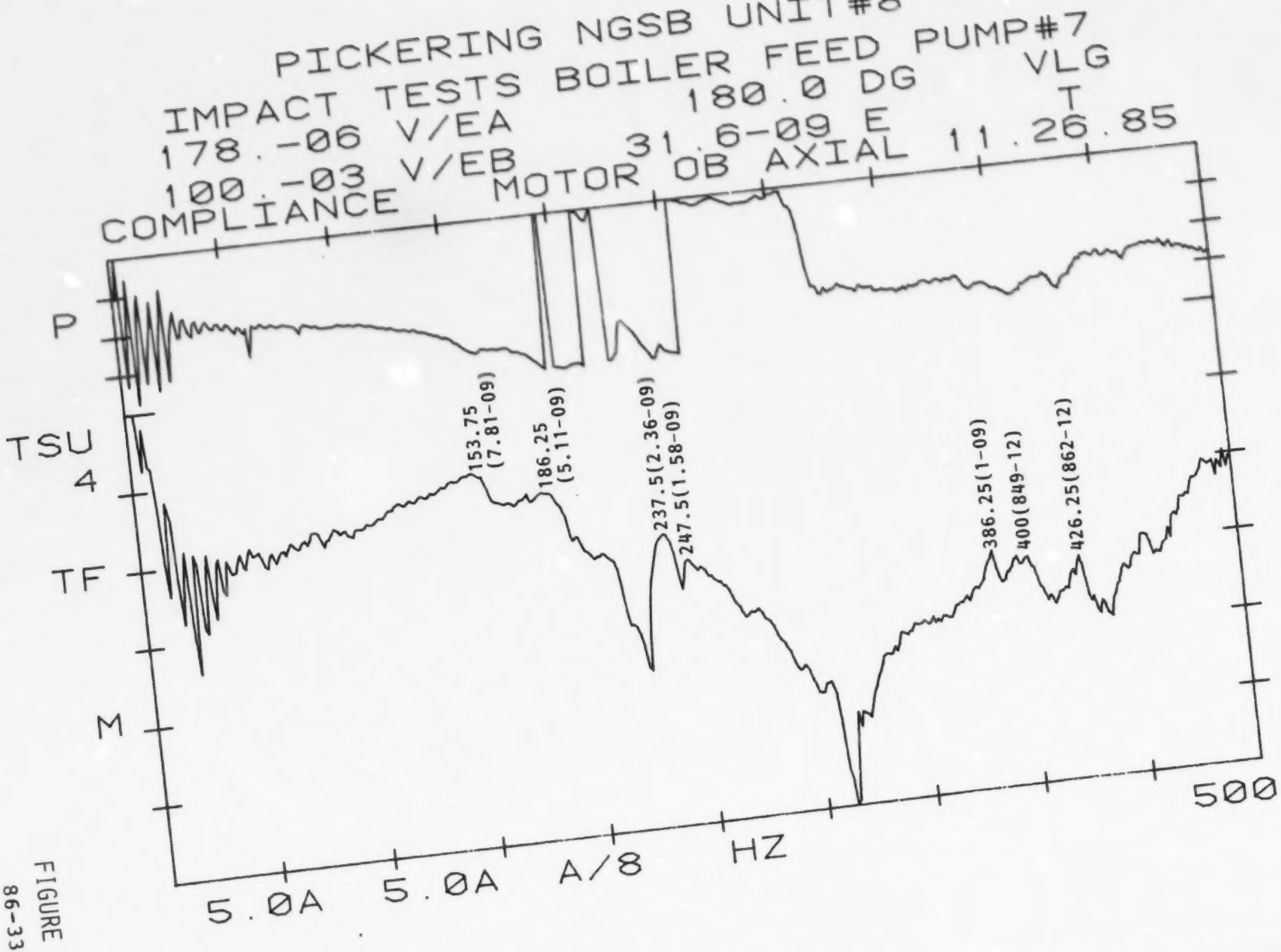

FIGURE A25
86-335

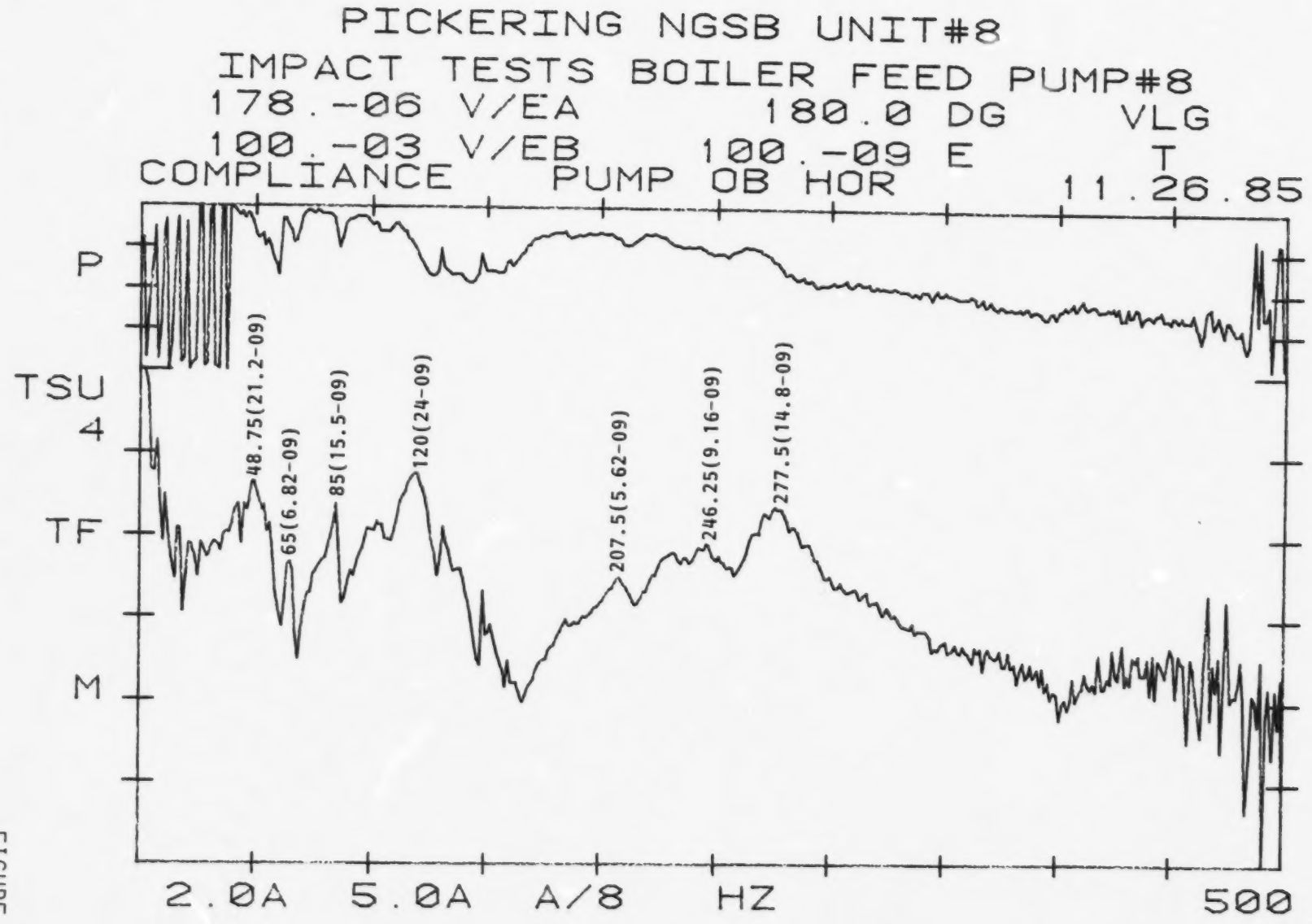

FIGURE A26

86-335

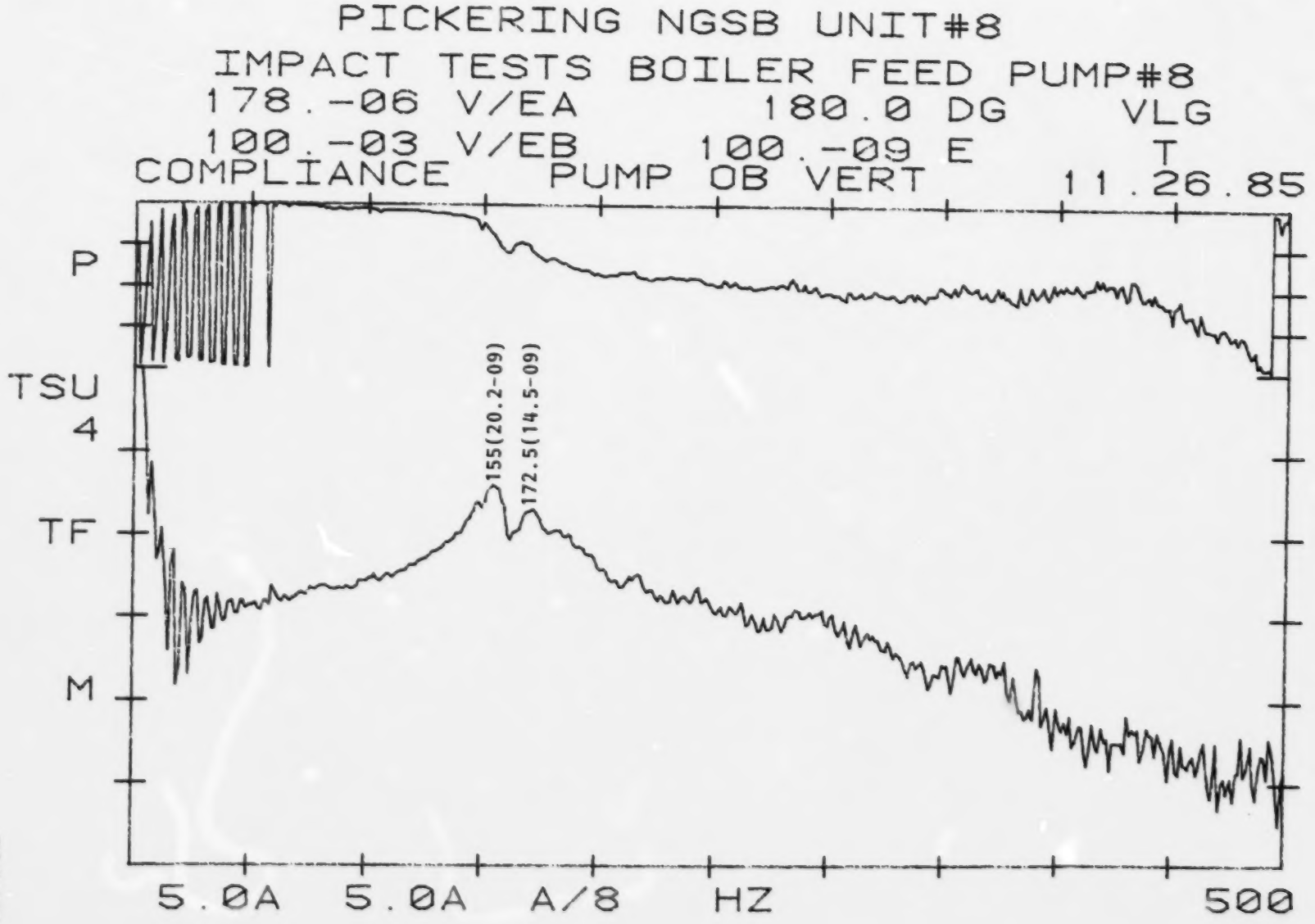

FIGURE A27
86-335

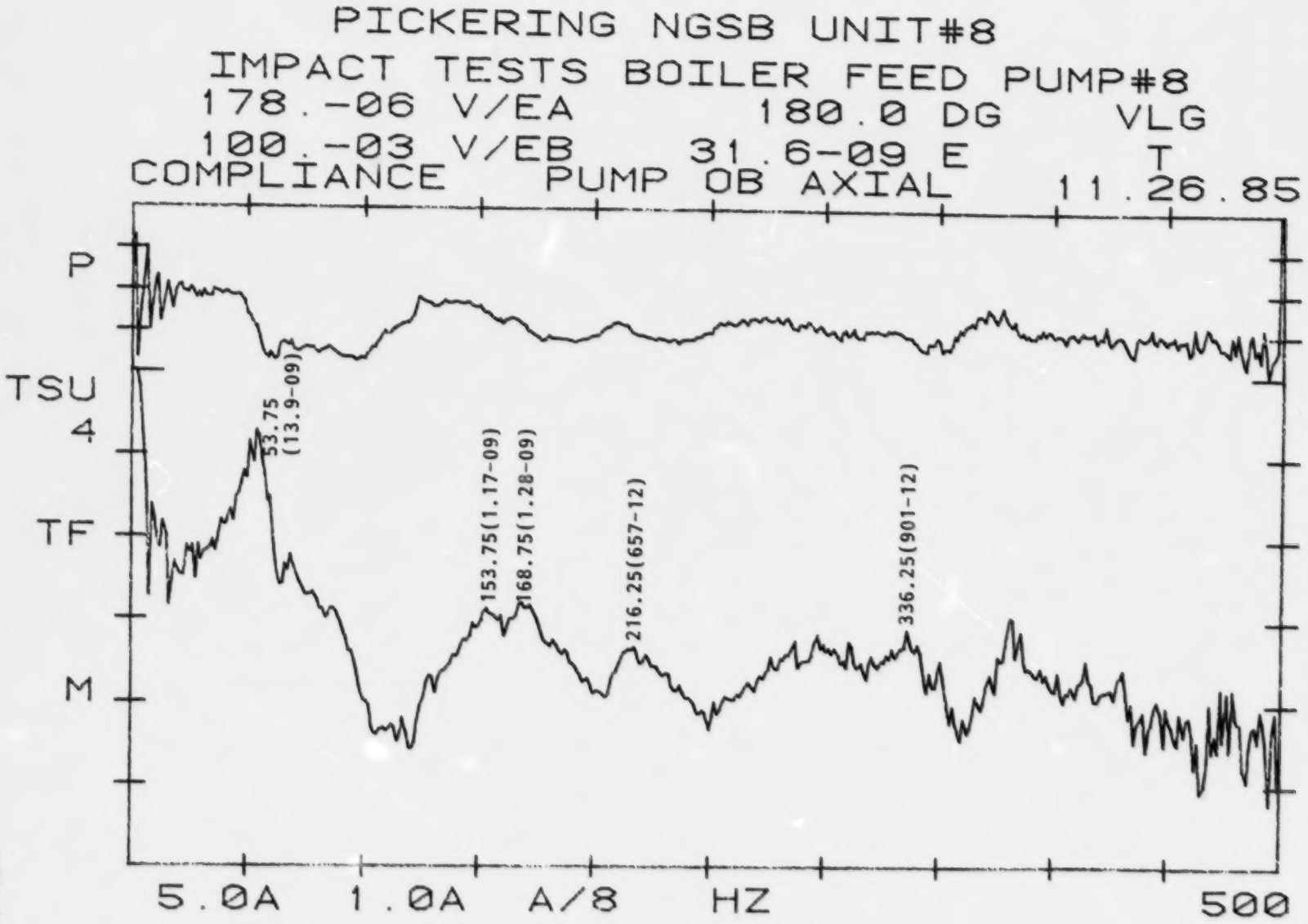

FIGURE A28
86-335

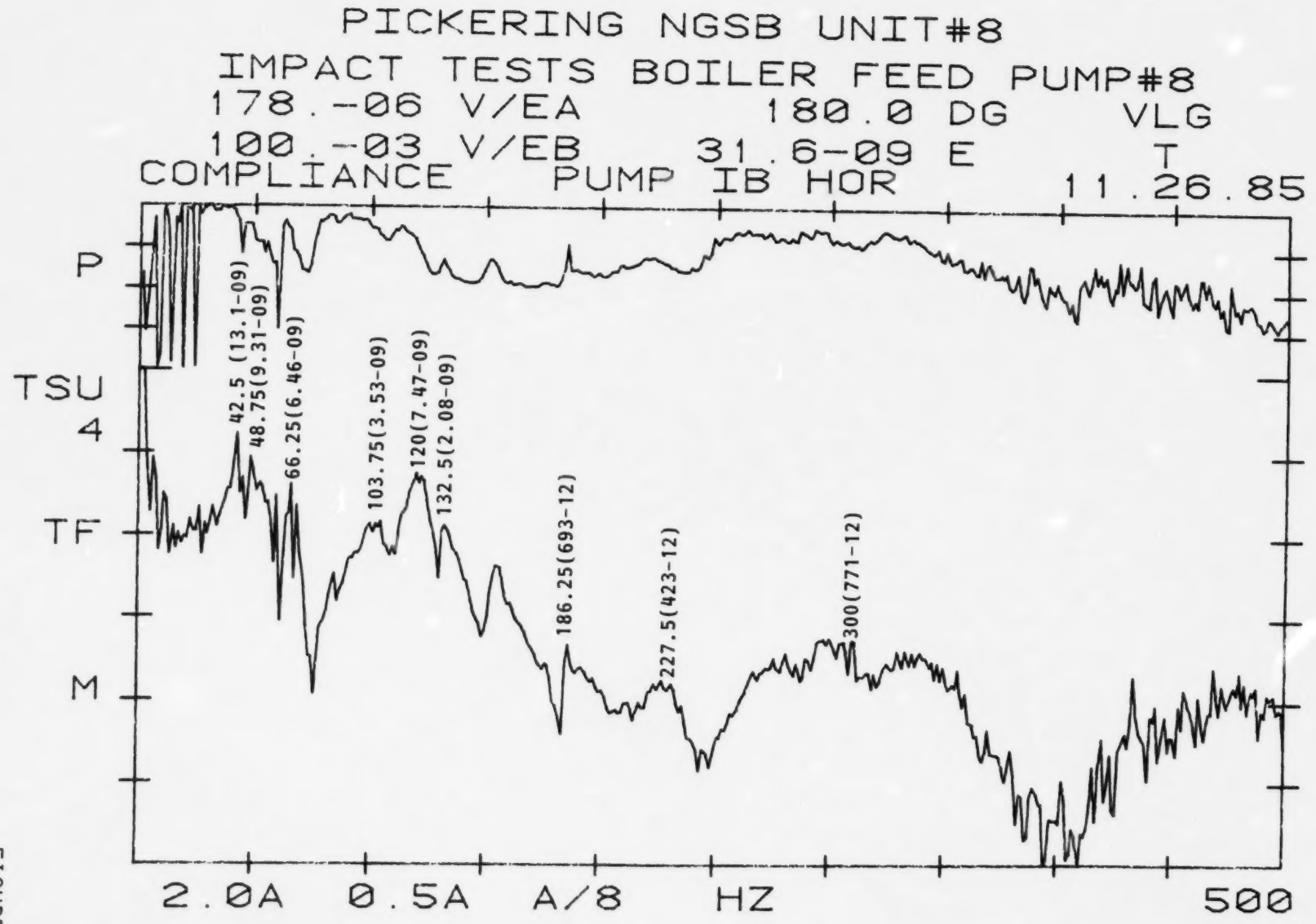

FIGURE A29
86-335

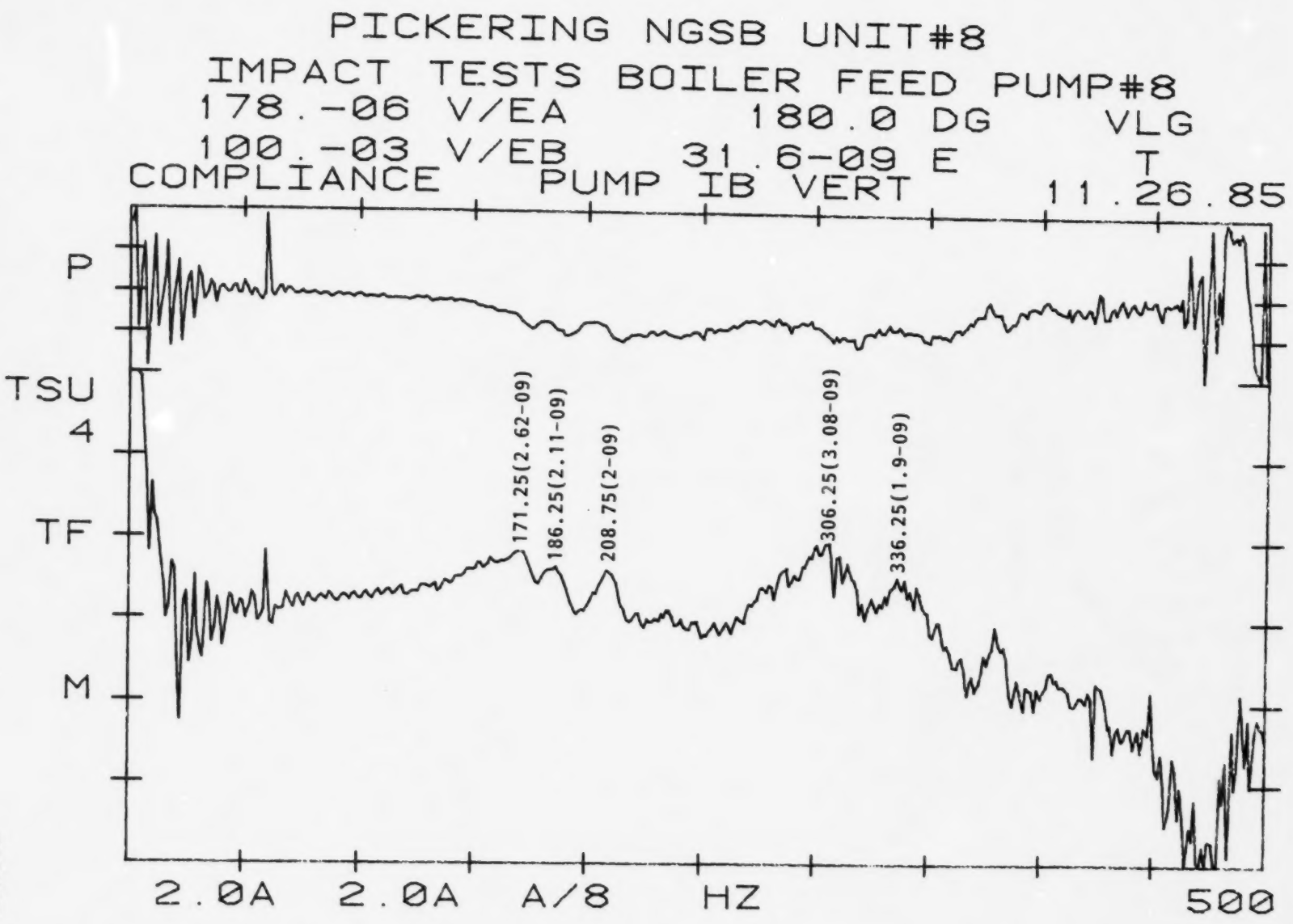

FIGURE A30

86-335

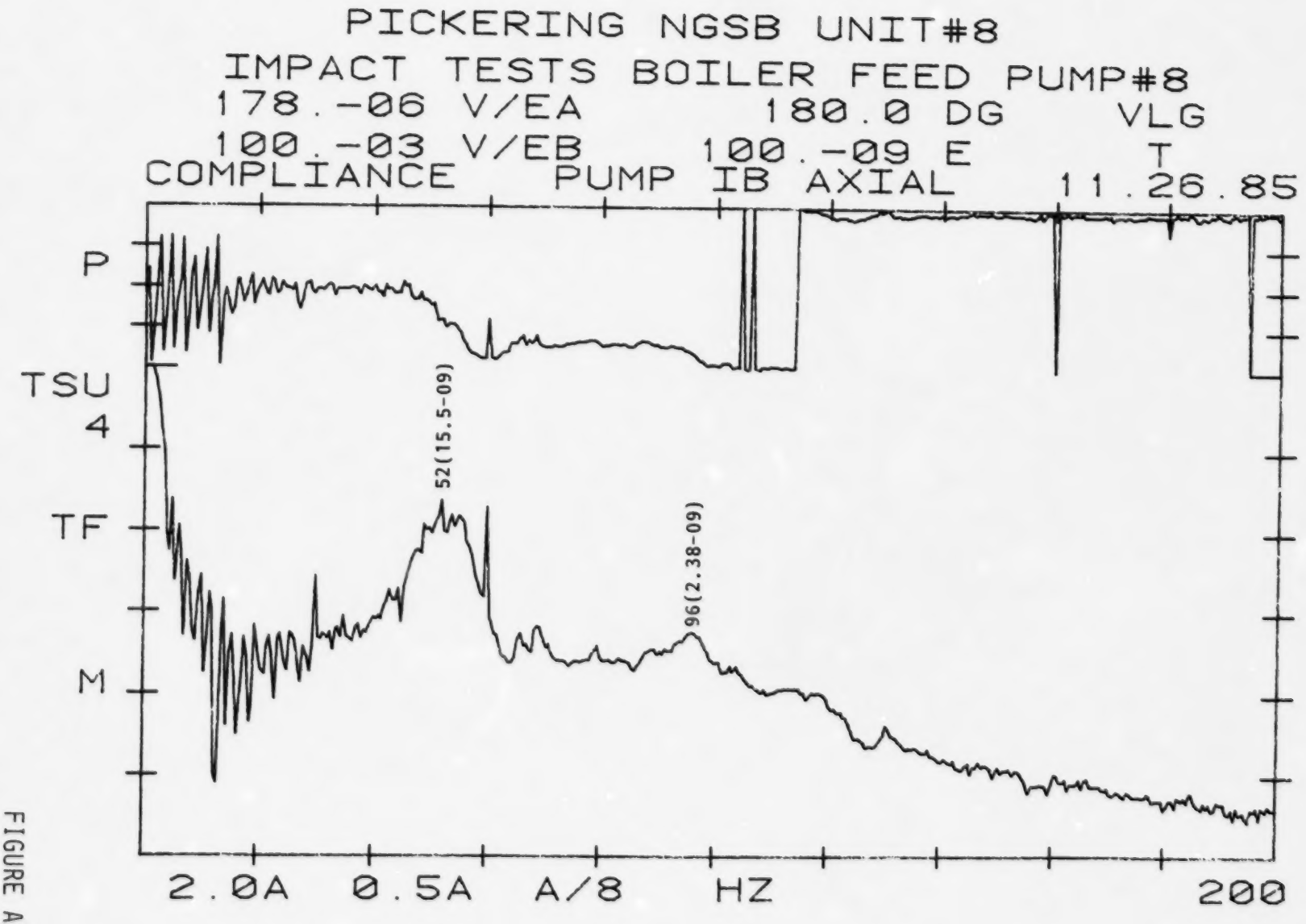

FIGURE A31

86-335

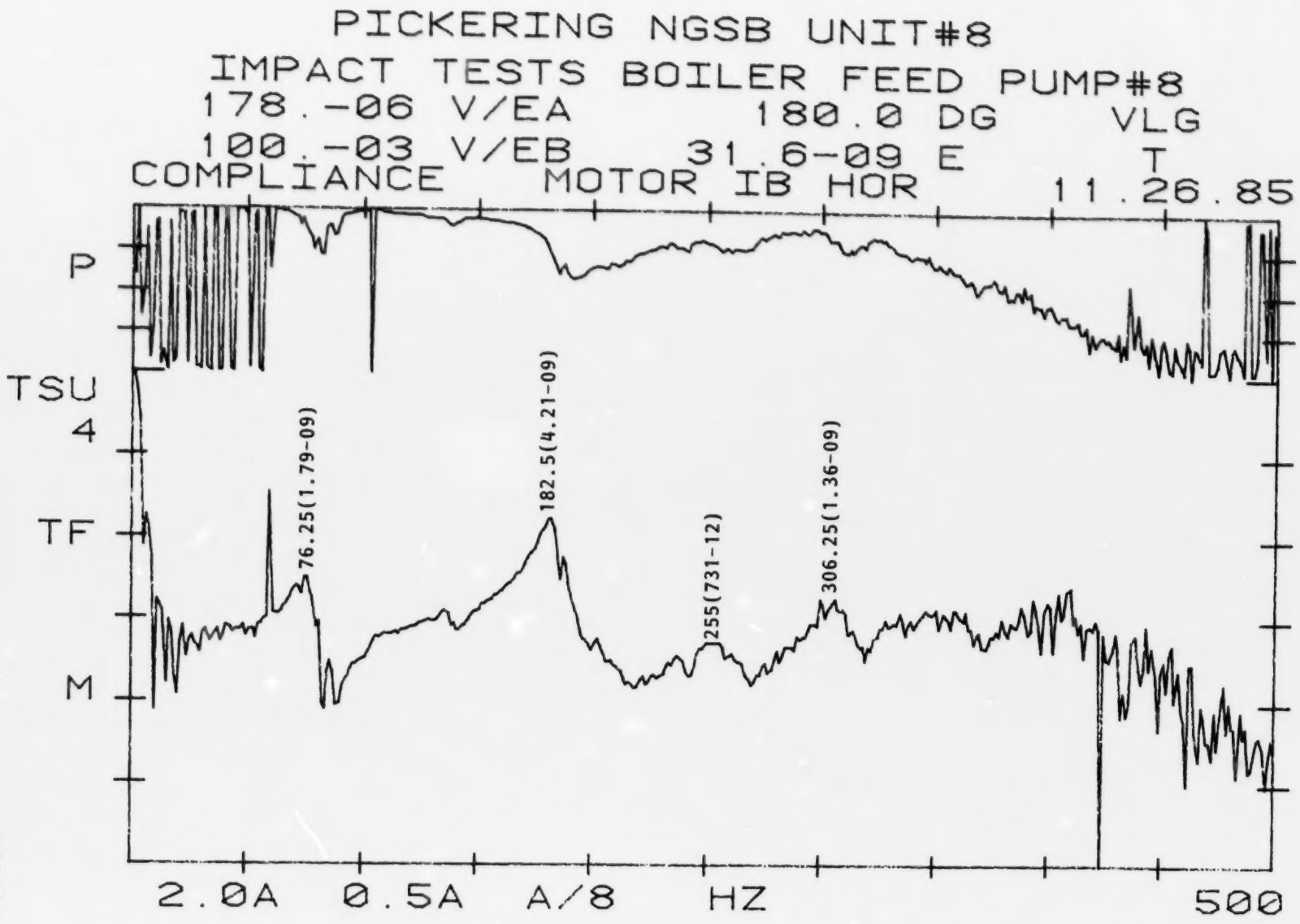

FIGURE A32
86-335

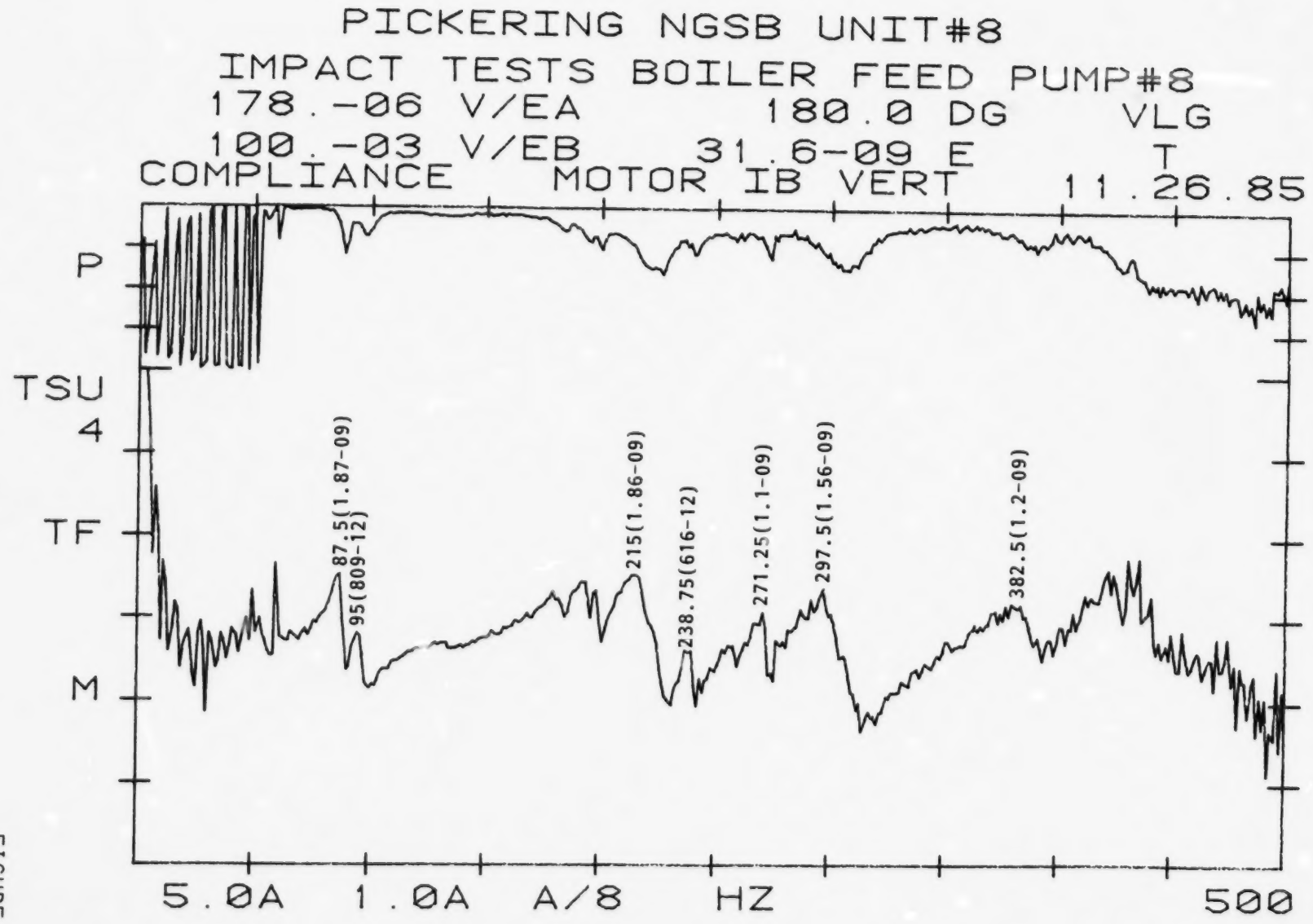

FIGURE A33
86-335

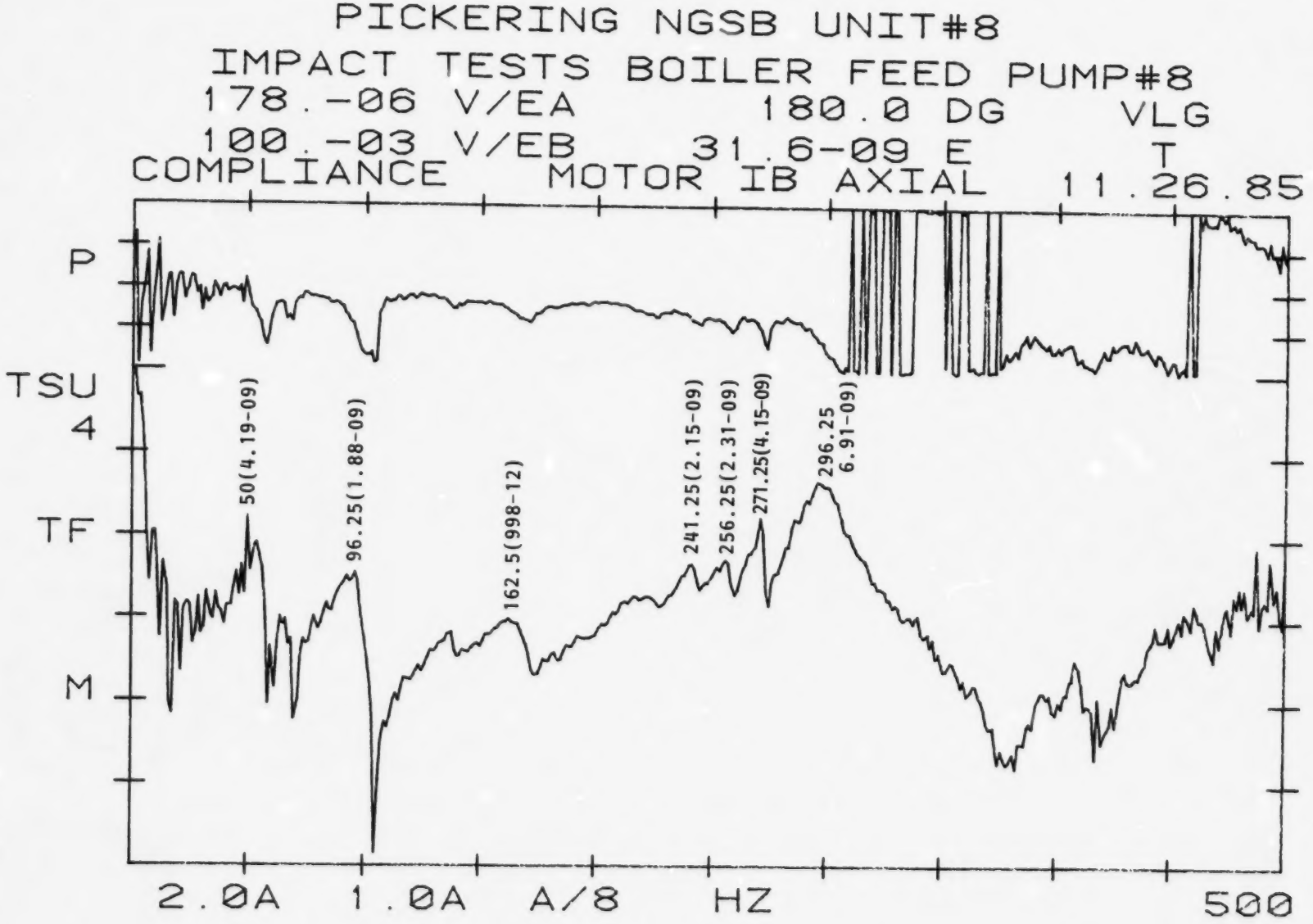
PICKERING NGSB UNIT#8
IMPACT TESTS BOILER FEED PUMP#8
178.-06 V/EA
180.0 DG
VLG
100.-03 V/EB
31.6-09 E
T
COMPLIANCE
MOTOR IB AXIAL
11.26.85
P
TSU
4
TF
M
50(4.19-09)
96.25(1.88-09)
162.5(998-12)
241.25(2.15-09)
256.25(2.31-09)
271.25(4.15-09)
296.25
6.91-09)
2.0A
1.0A
A/8
HZ
500

FIGURE A34

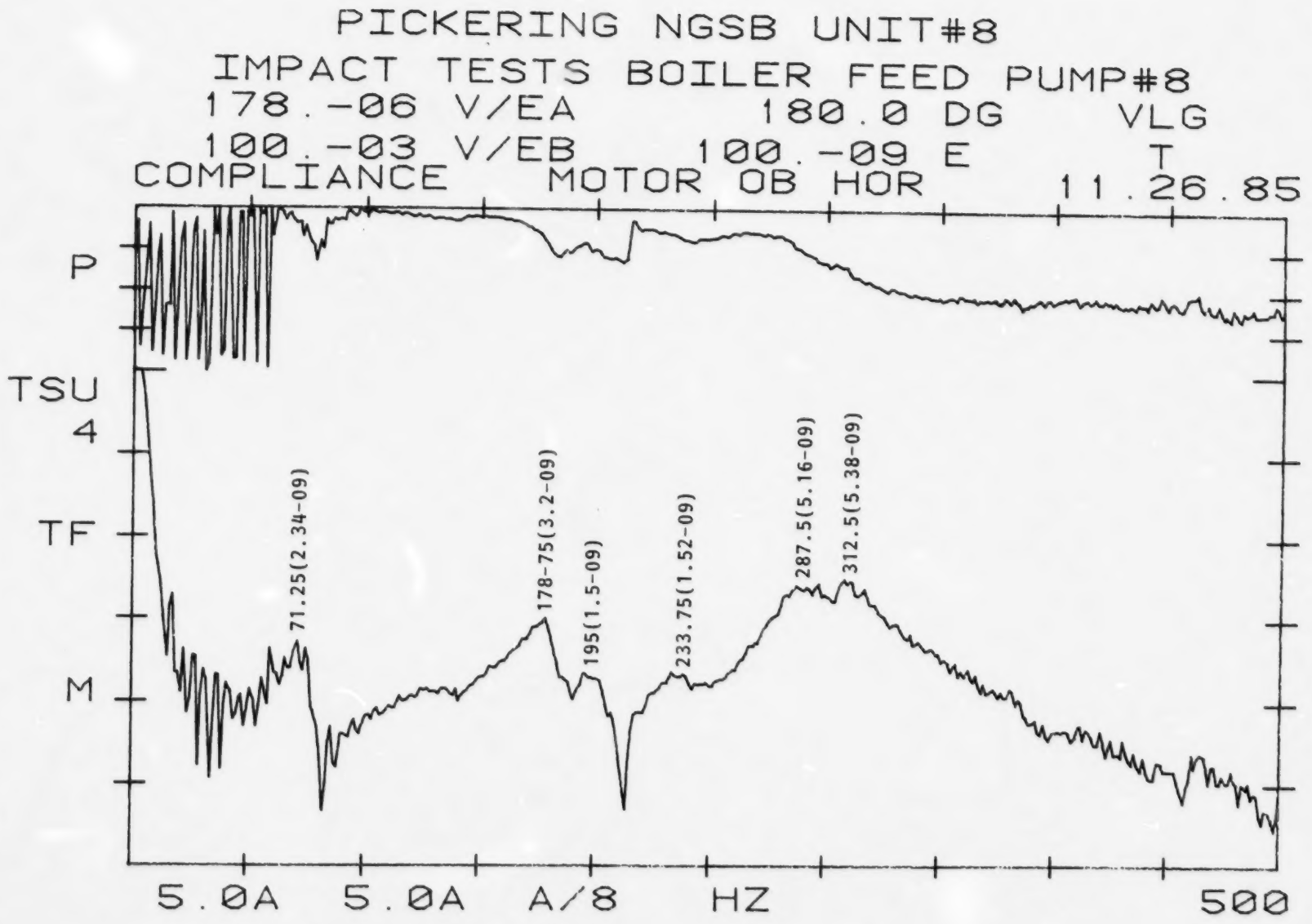

FIGURE A35
86-335

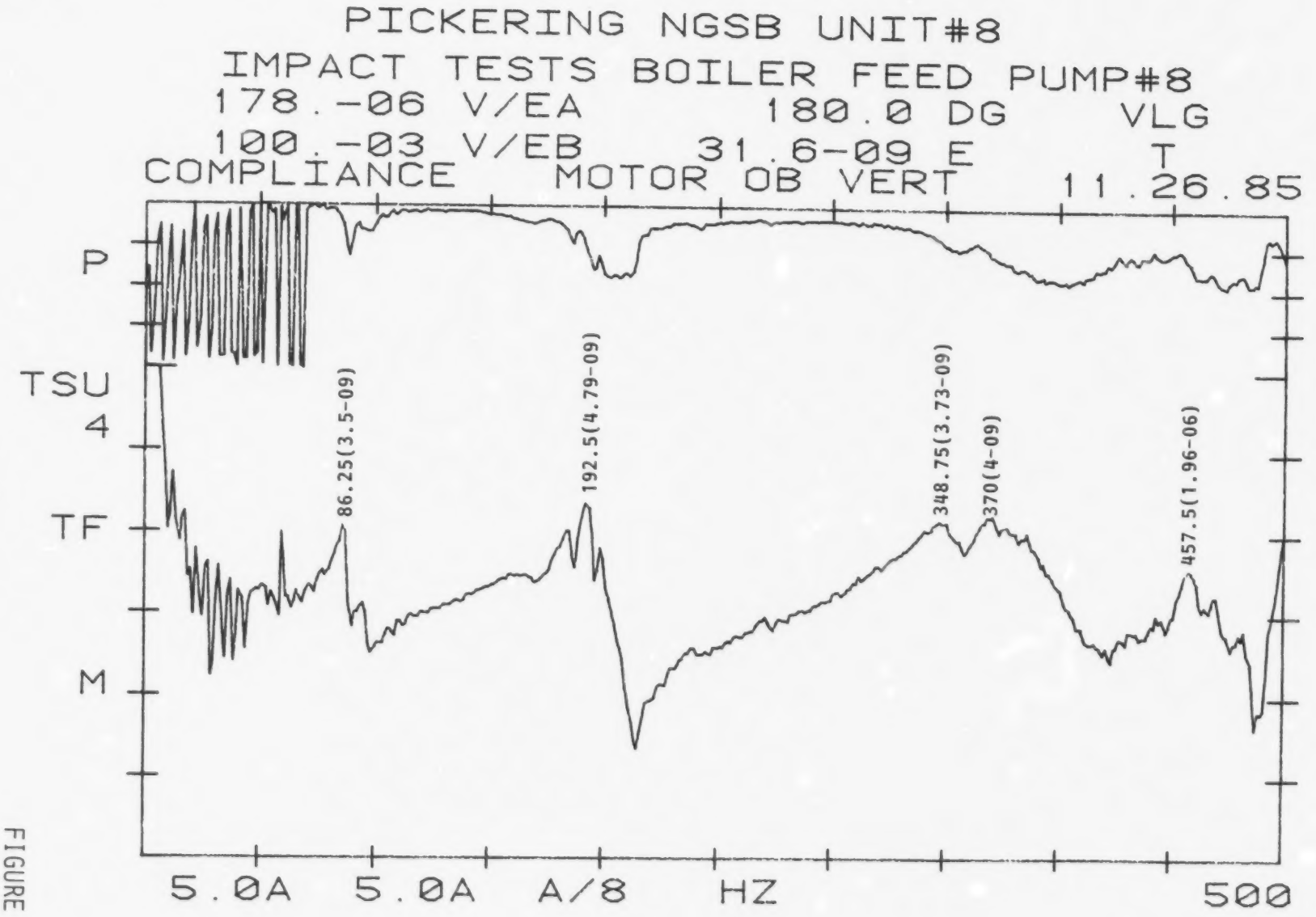

FIGURE A36
86-335

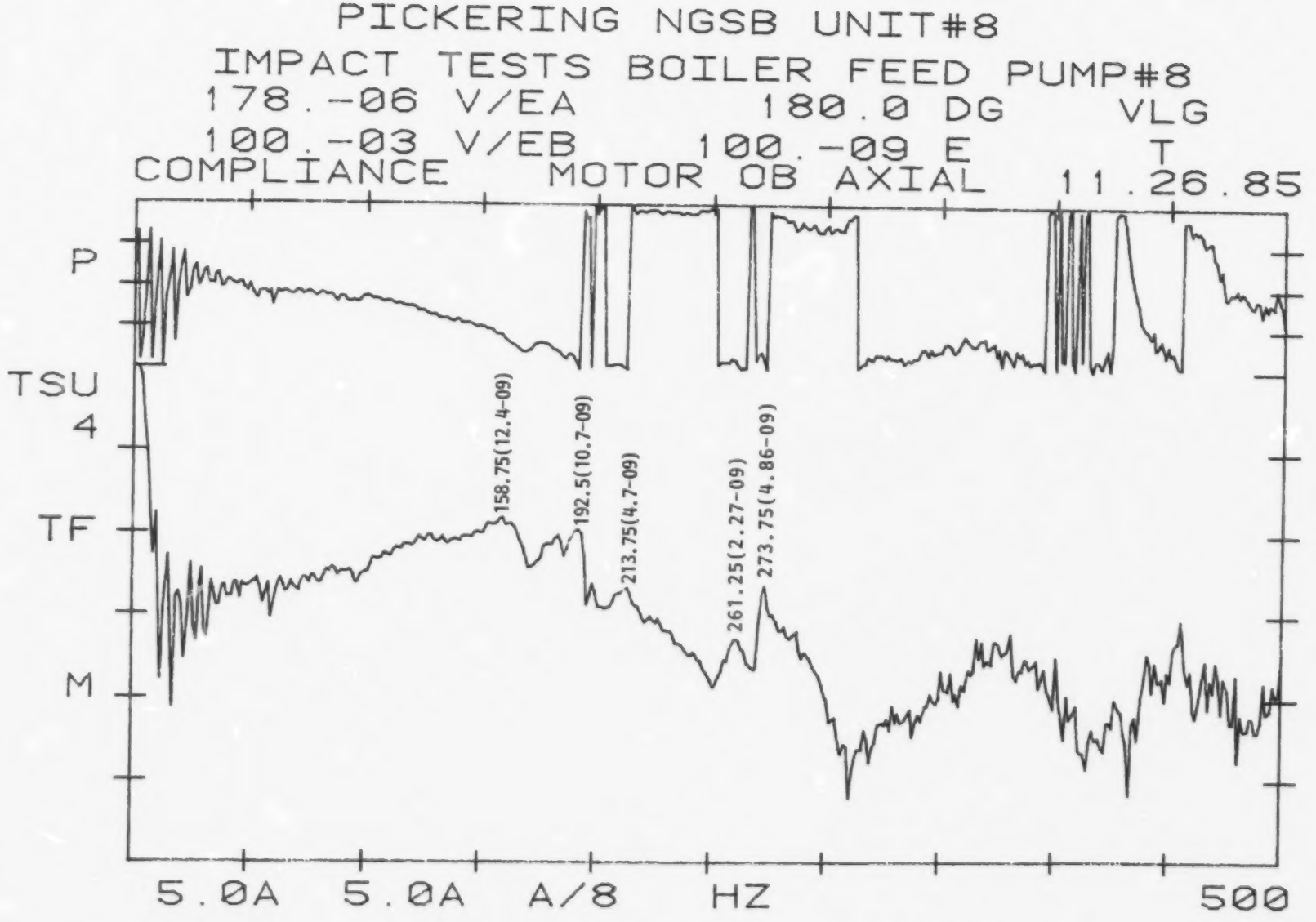

FIGURE A37
86-335

APPENDIX B

Compliance Transfer Function (Impact Spectra)
Auxiliary Boiler Feed Pumpset 5

Fig No	Description	Frequency Range (Hz)
B1	Pump O/B Bearing - Horiz	1-500
B2	Pump O/B Bearing - Vert	1-500
B3	Pump O/B Bearing - Axial	1-500
B4	Pump I/B Bearing - Horiz	1-500
B5	Pump I/B Bearing - Vert	1-500
B6	Pump I/B Bearing - Axial	1-500
B7	Motor I/B Bearing - Horiz	1-500
B8	Motor I/B Bearing - Vert	1-500
B9	Motor I/B Bearing - Axial	1-500
B10	Motor O/B Bearing - Horiz	1-500
B11	Motor O/B Bearing - Vert	1-500
B12	Motor O/B Bearing - Axial	1-500

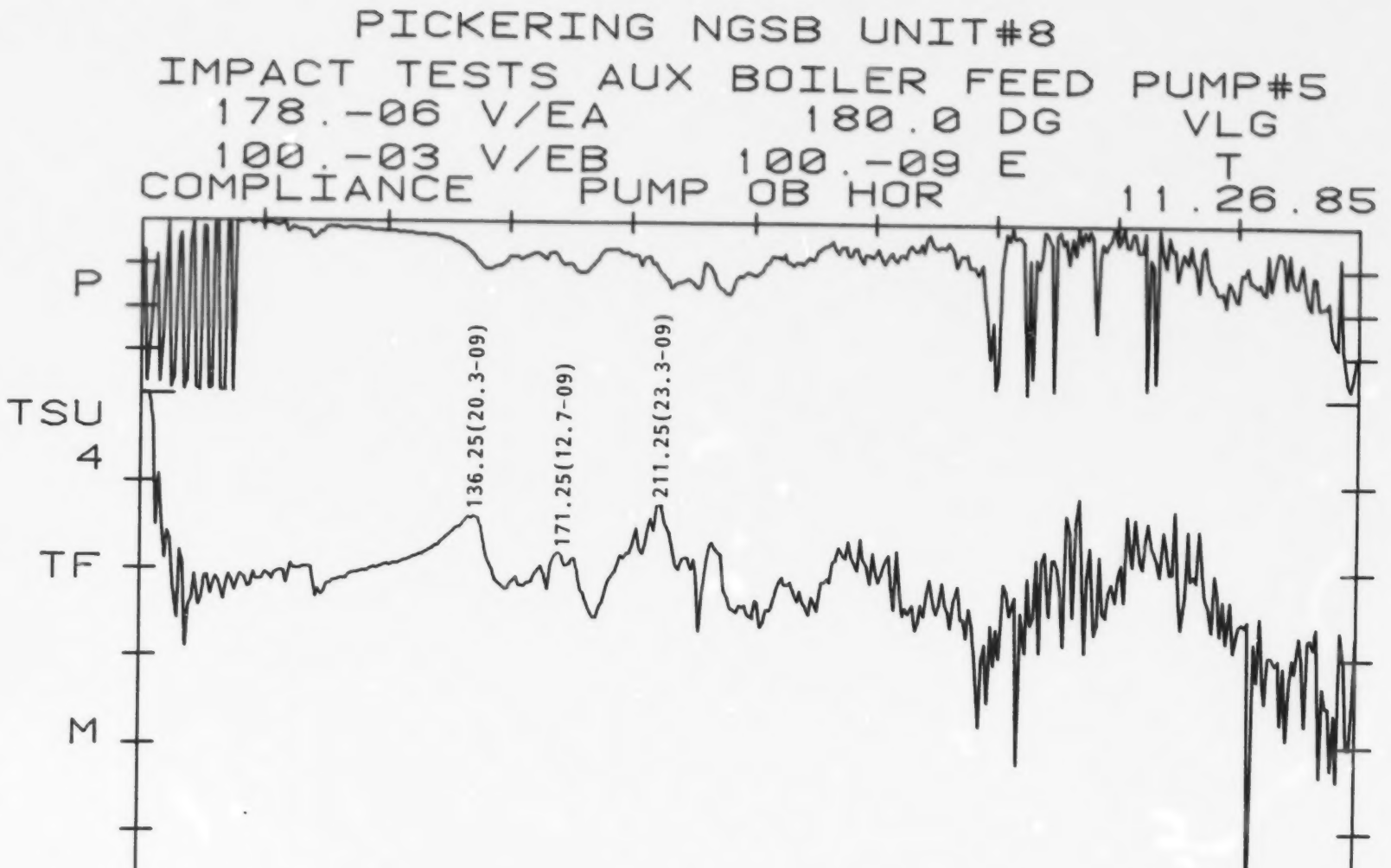

FIGURE B1
86-335

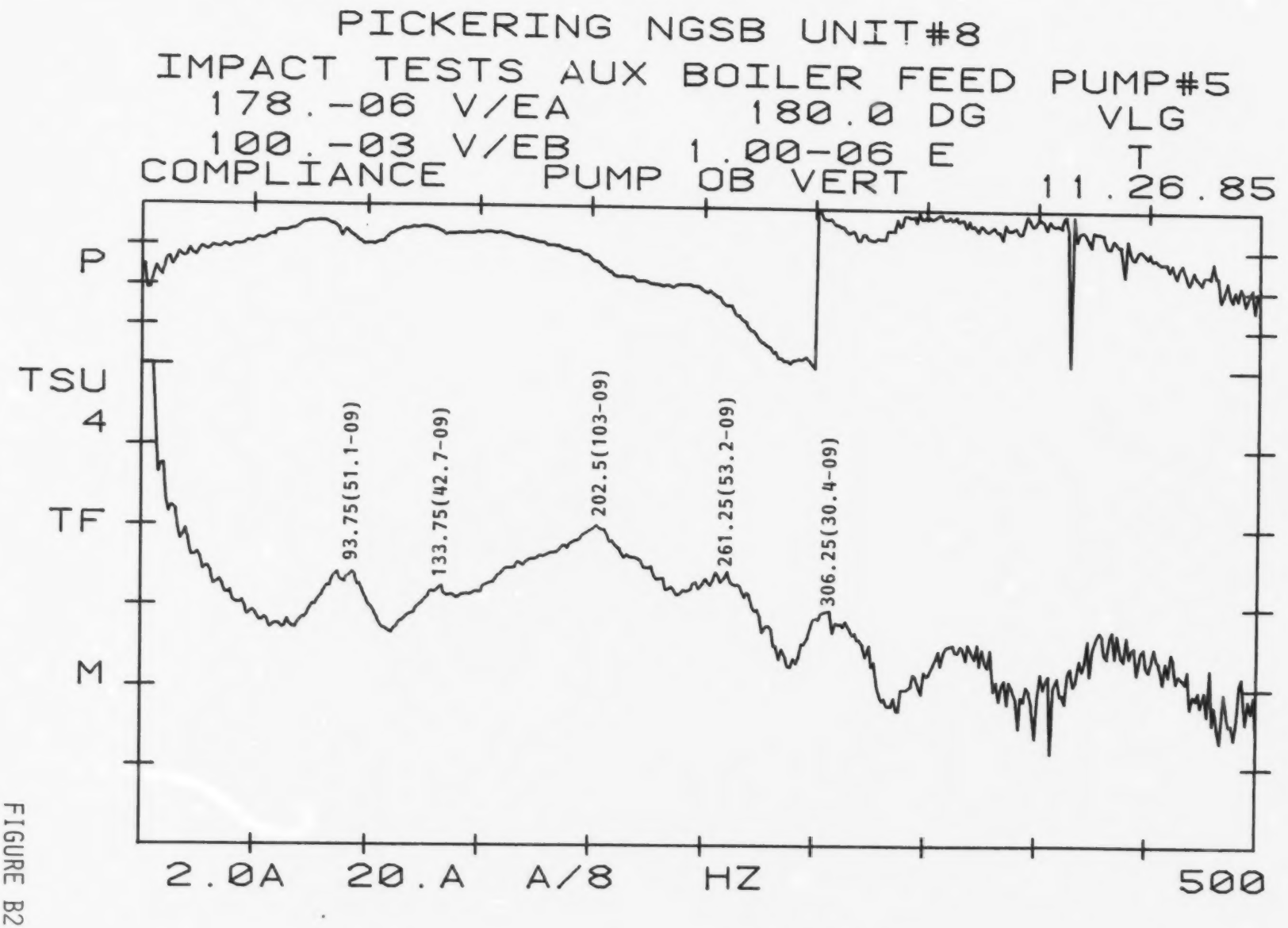
PICKERING NGSB UNIT#8
IMPACT TESTS AUX BOILER FEED PUMP#5
178.-06 V/EA
180.0 DG
VLG
100.-03 V/EB
1.00-06 E
T
COMPLIANCE
PUMP OB VERT
11.26.85
P
TSU
4
TF
M
93.75(51.1-09)
133.75(42.7-09)
202.5(103-09)
261.25(53.2-09)
306.25(30.4-09)
2.0A
20.A
A/8
HZ
500

FIGURE B2

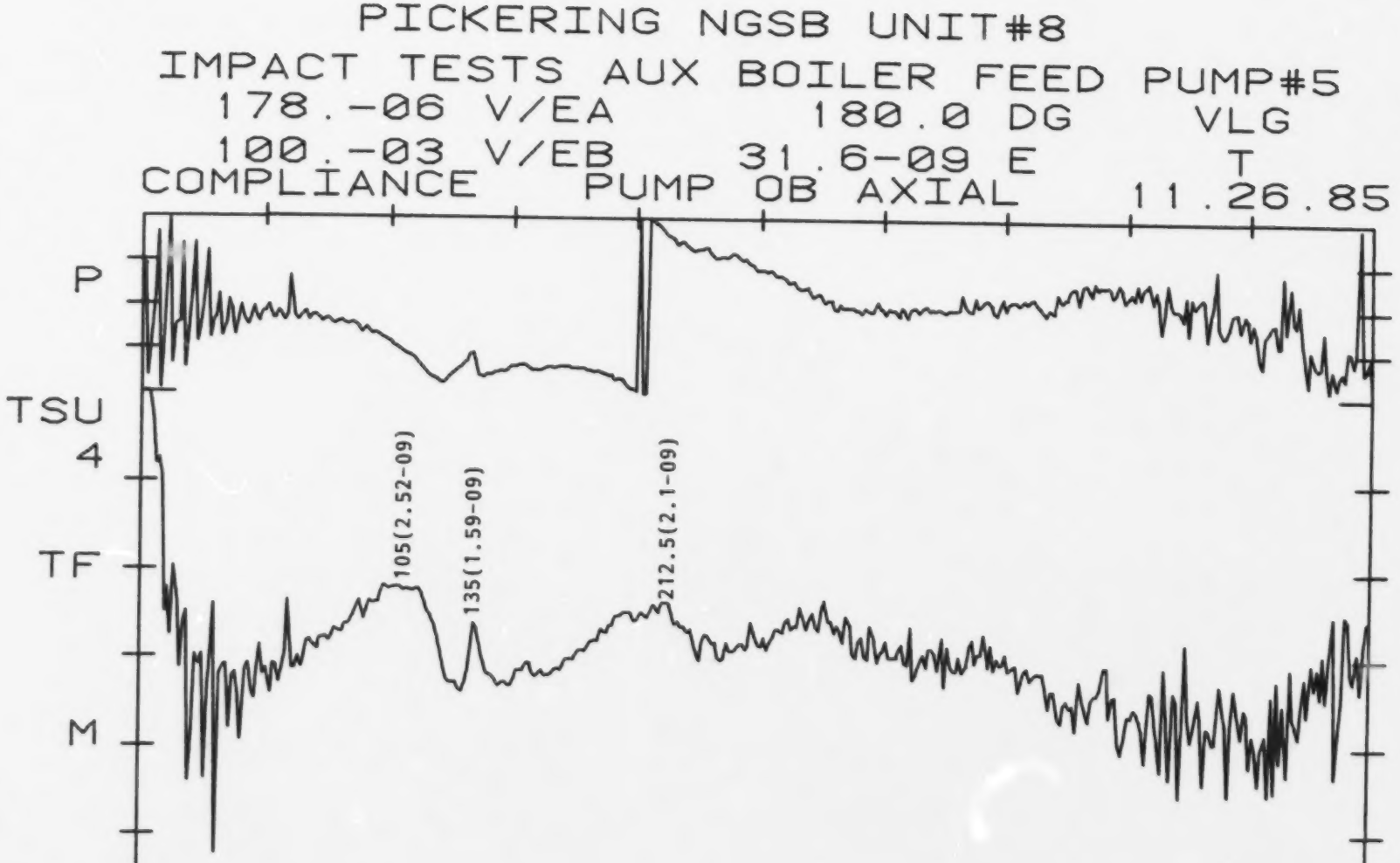

FIGURE B3
86-335

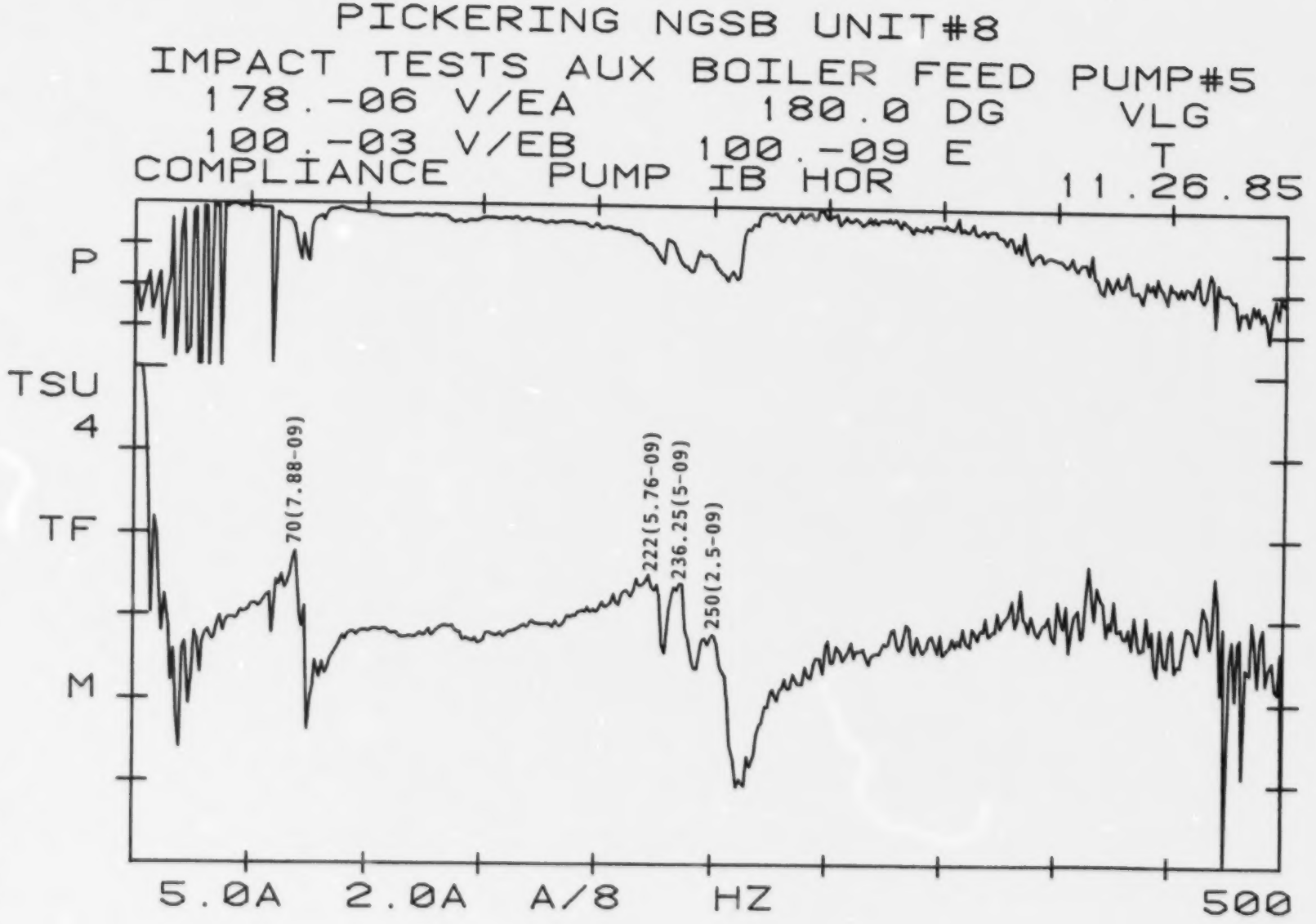

FIGURE B4
86-335

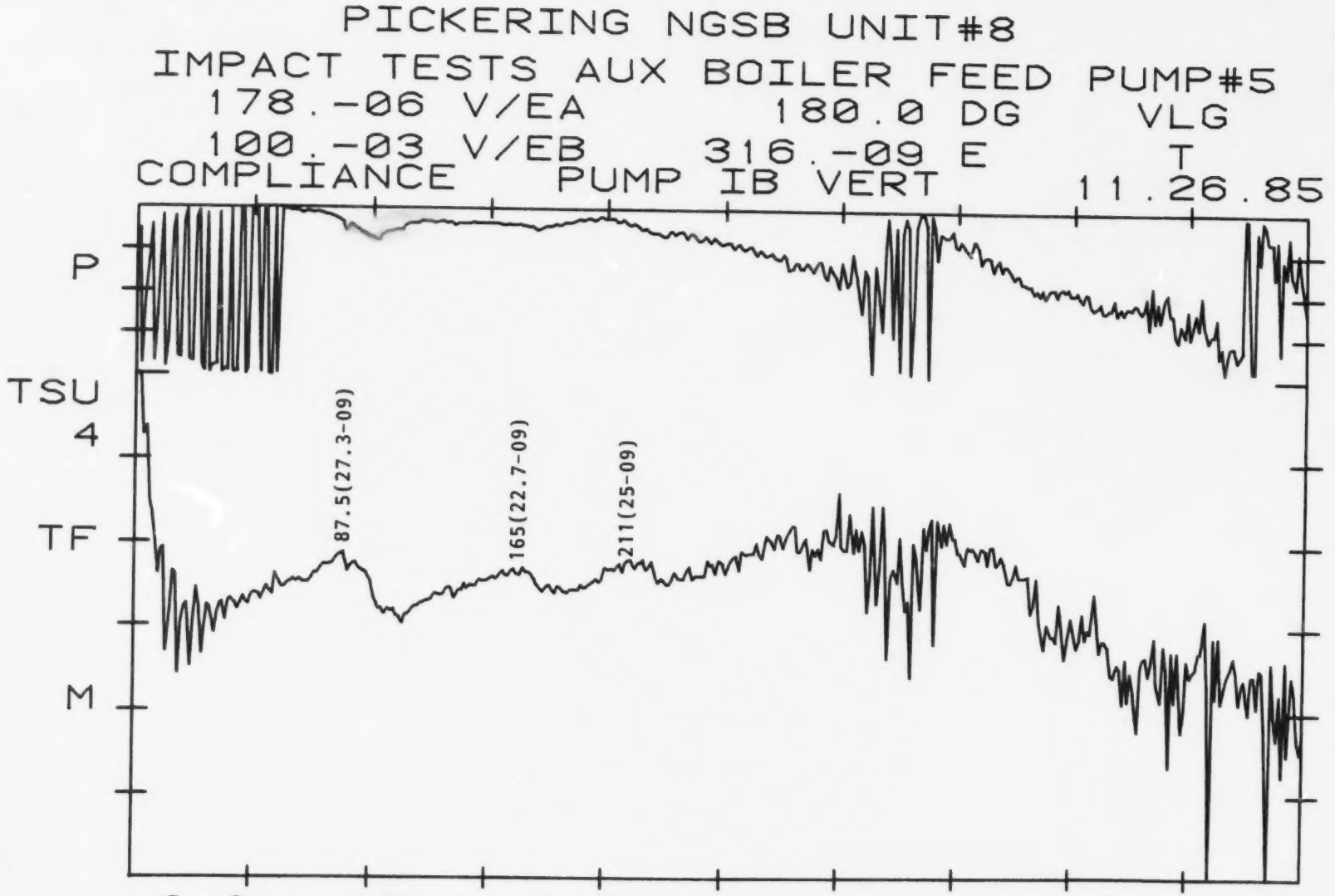
PICKERING NGSB UNIT#8
IMPACT TESTS AUX BOILER FEED PUMP#5
178.-06 V/EA
180.0 DG
VLG
100.-03 V/EB
316.-09 E
T
COMPLIANCE
PUMP IB VERT
11.26.85
P
TSU
4
TF
M
87.5(27.3-09)
165(22.7-09)
211(25-09)
2.0A
10.A
A/8
HZ
500

FIGURE B5

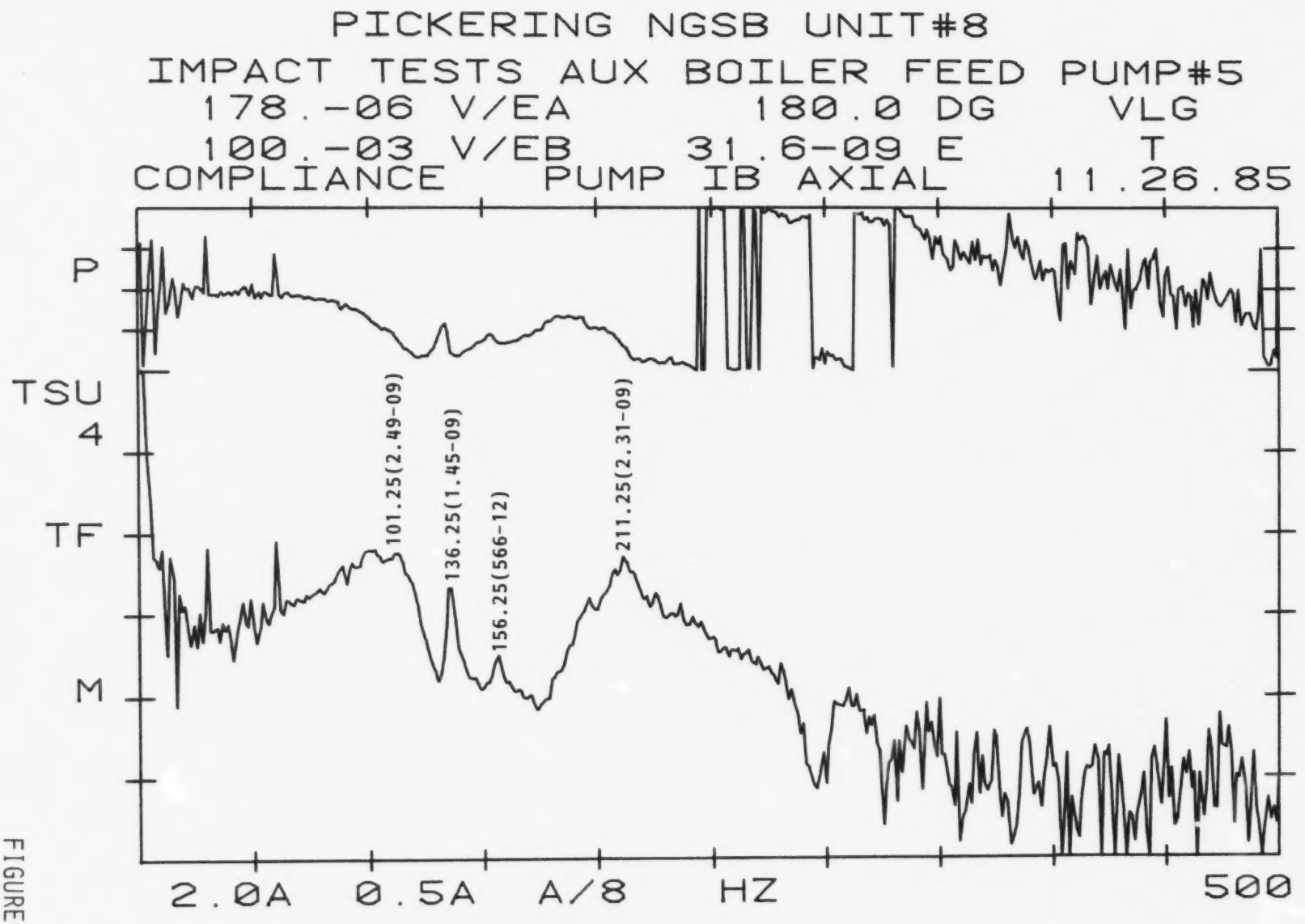

FIGURE B6
86-335

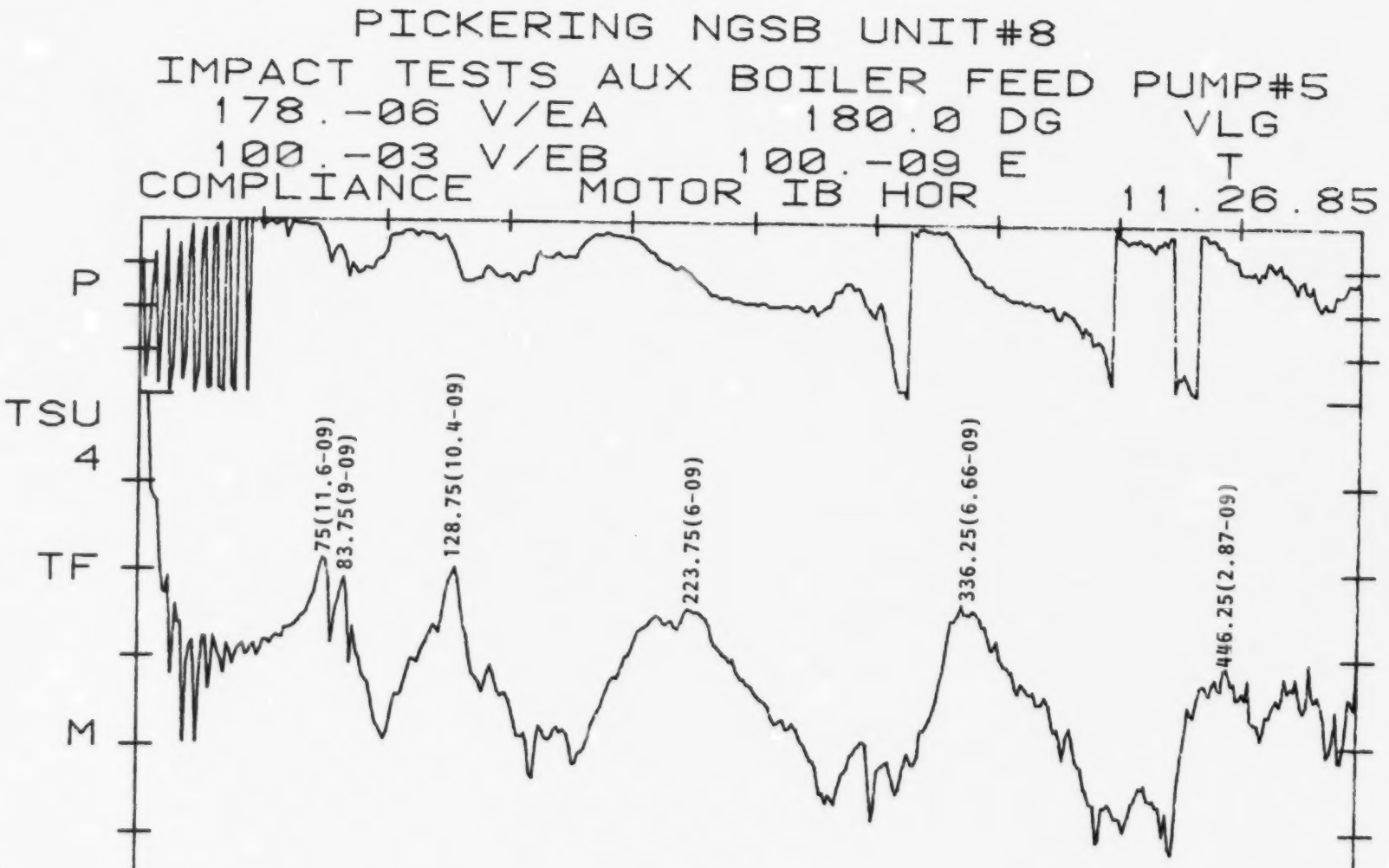

FIGURE B7
86-335

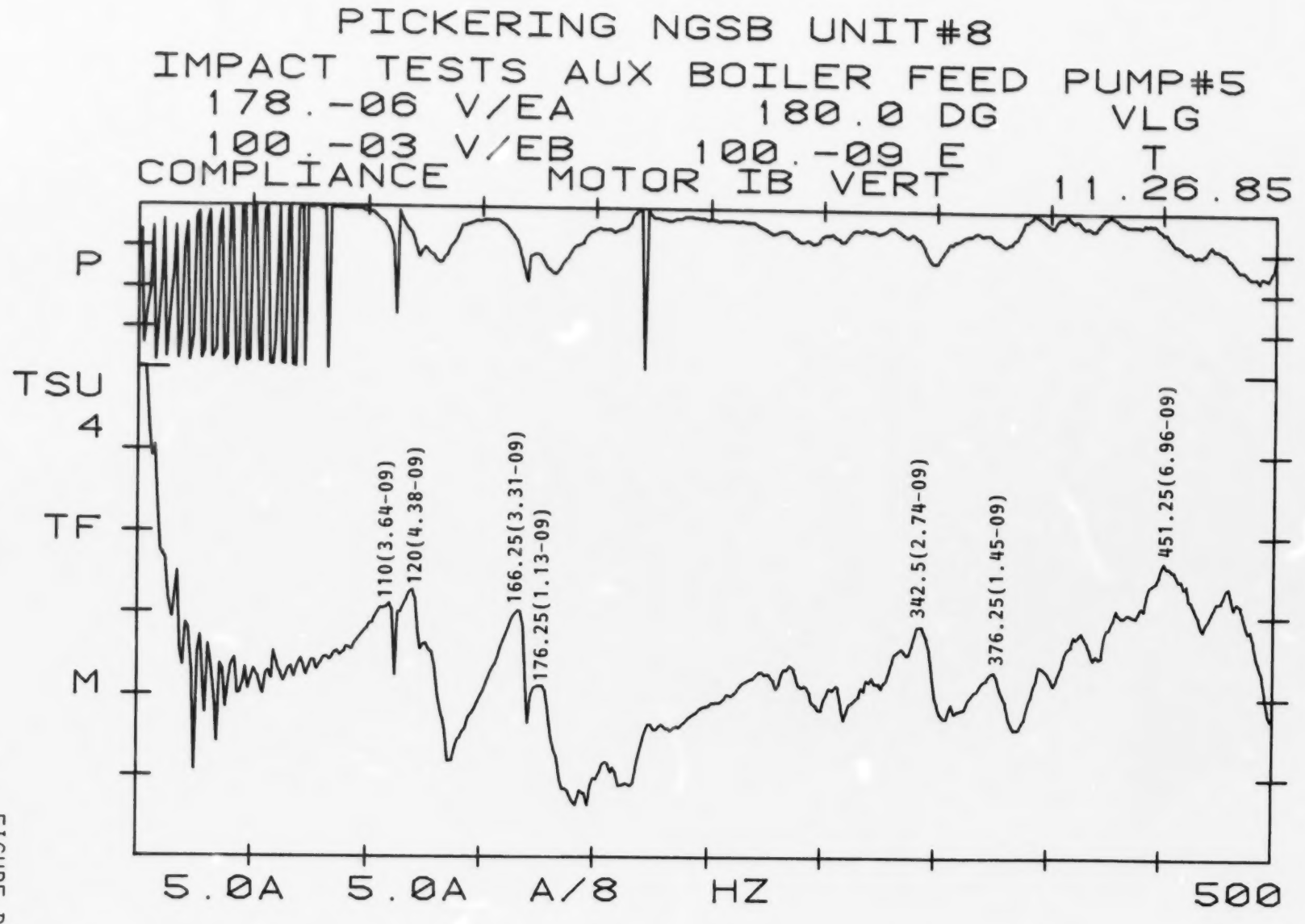

FIGURE B8

86-335

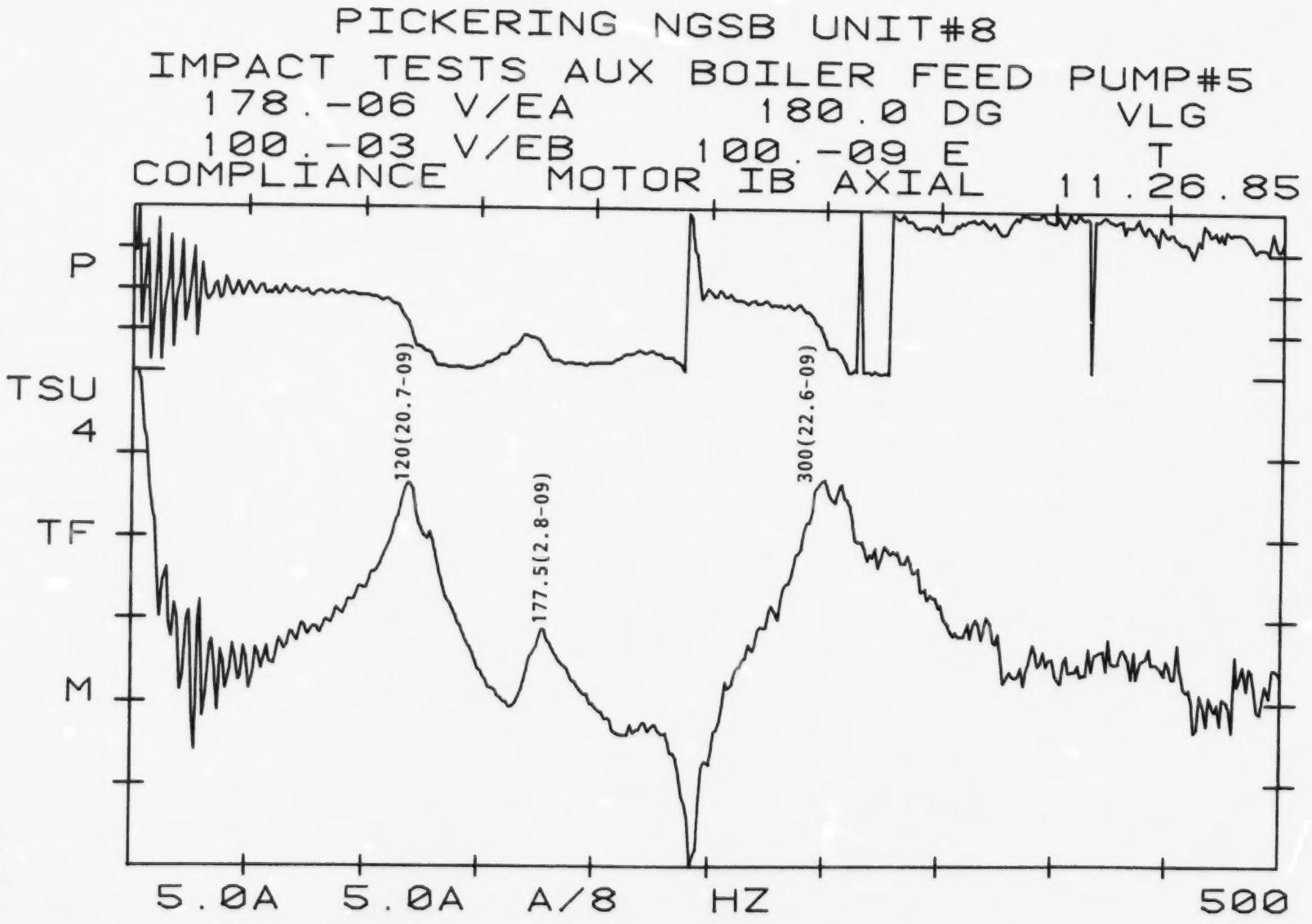

FIGURE B9
86-335

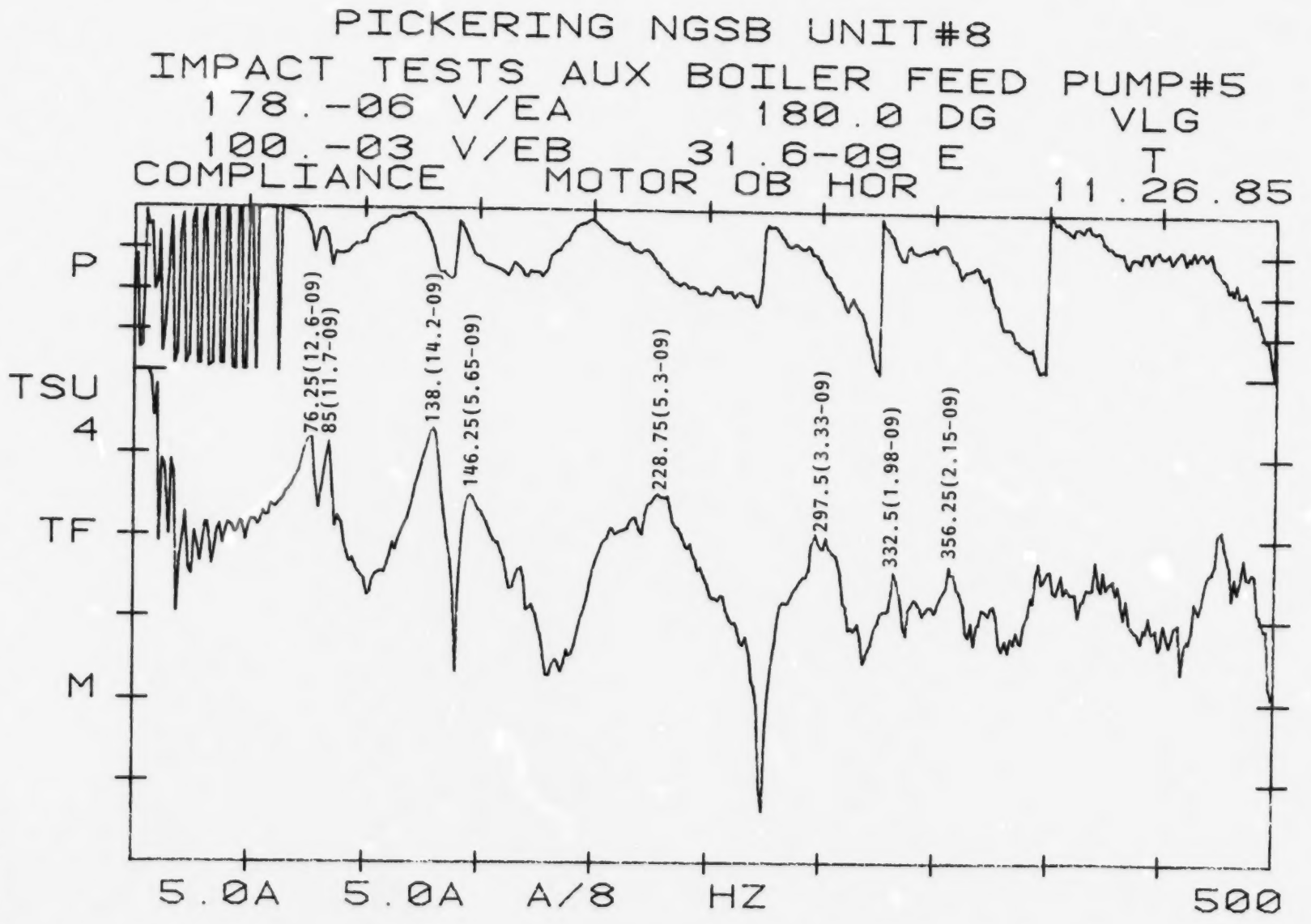

FIGURE B10

86-335

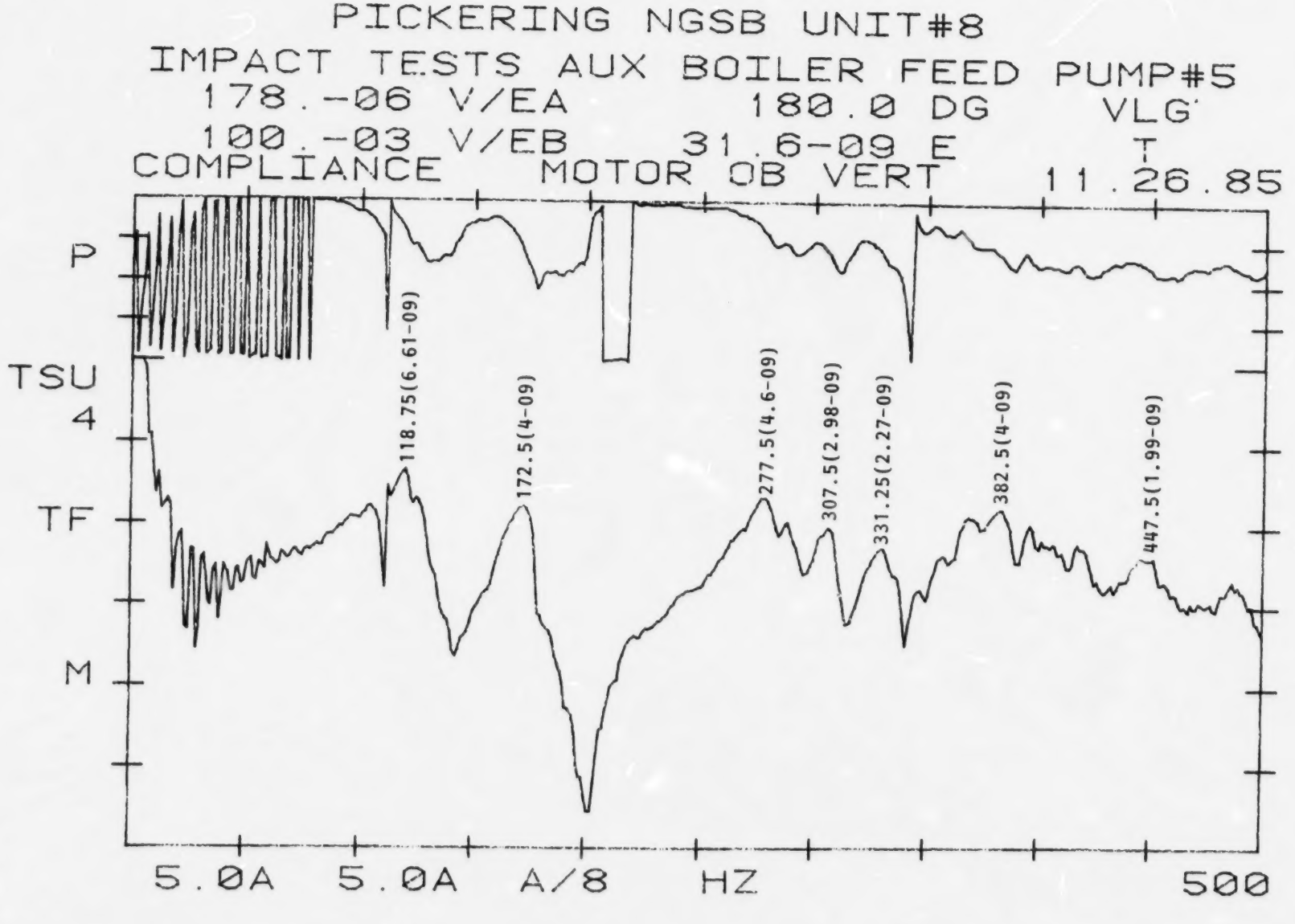

FIGURE B11
86-335

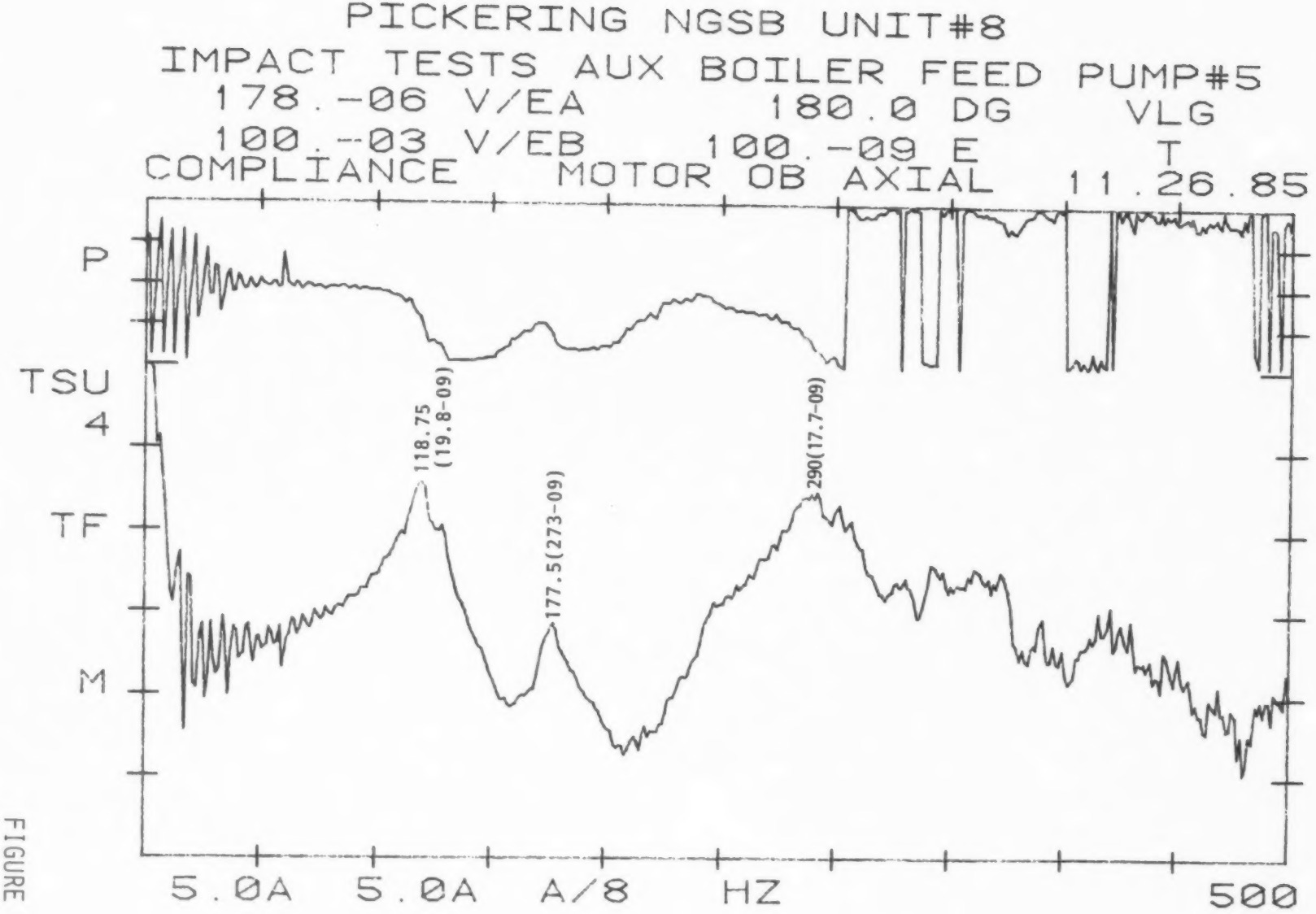

FIGURE B12
86-335

APPENDIX C

Boiler Feed Pumpsets 6 & 8
Vibration Velocity Against Time at Full Unit Load

Pumpset No	Description	Fig No.
P6	Pump O/B Bearing - Horiz (YE2)	C1
	Motor I/B Bearing - Vert (YE1)	C1
P7	Data Unavailable	
P8	Pump O/B Bearing - Horiz (YE2)	C1
	Motor I/B Bearing - Vert (YE1)	C1

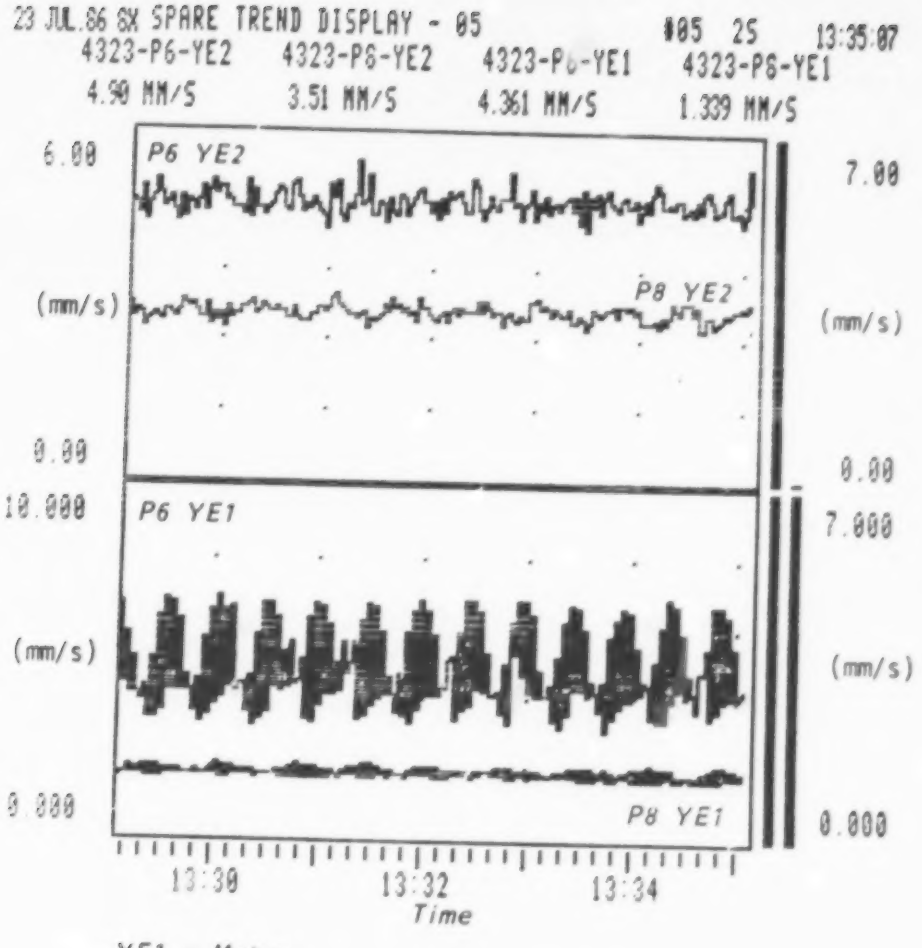

FIGURE C1

BOILER FEED PUMPSETS 6&8
VIBRATION VELUCITY (MM/S) TREND DISPLAYS

APPENDIX D

Boiler Feed Pumpsets 6 & 8
Vibration Spectra at Full Unit Load

Pumpset No	Figure	Description	Frequency Range (Hz)
P6	D1	Motor (YE1)	1-200
	D2	Motor (YE1)	1-500
	D3	Pump (YE2)	1-200
	D4	Pump (YE2)	1-500
P7	No data available		
P8	D5	Motor (YE1)	1-200
	D6	Motor (YE1)	1-500
	D7	Pump (YE2)	1-200
	D8	Pump (YE2)	1-500

PICKERING NGS"B" UNIT#8
BOILER FEED PUMP#6 YE-1 (MOTOR)
REACTOR POWER 99% 07/23/86

PEAK NO.	FREQUENCY	AMPLITUDE
1	60	4.415
2	119.5	2.349
3	179	.5593
4	149.5	.4373
5	90	.1561
6	30	.07898
7	145	.06473
8	143	.0532
9	.5	.04336
10	108	.04208
11	115	.04008
12	163.5	.03906
13	71.5	.03838
14	160	.03808
15	139.5	.03792
16	64.5	.03761
17	167.5	.03661
18	124.5	.03607
19	135	.0352
20	168	.03393

83.6-03 V/EA 31.6+00 E VLG

C

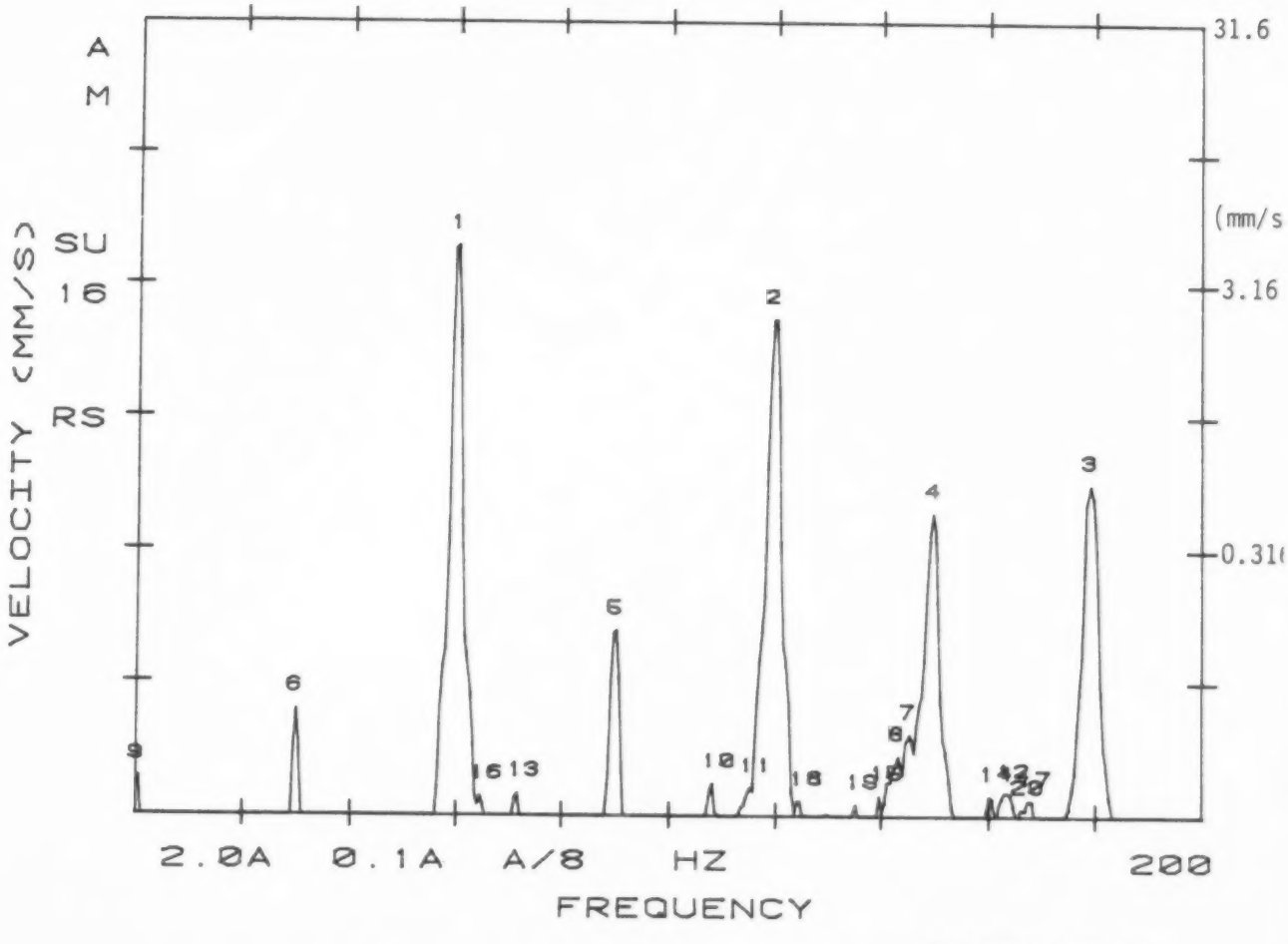

FIGURE D1

86-335

PICKERING NGS"B" UNIT#8
BOILER FEED PUMP#6 YE-1 (MOTOR)
REACTOR POWER 99% 07/23/86

PEAK NO.	FREQUENCY	AMPLITUDE
1	60	4.415
2	120	2.507
3	298.75	1.157
4	178.75	.5678
5	150	.4414
6	238.75	.3104
7	358.75	.2808
8	208.75	.247
9	268.75	.1956
10	328.75	.1792
11	90	.173
12	418.75	.1625
13	478.75	.146
14	388.75	.09229
15	143.75	.08765
16	448.75	.08601
17	30	.07898
18	380	.06615
19	107.5	.05739
20	71.25	.05692

83.6-03 V/EA 31.6+00 E VLG

C

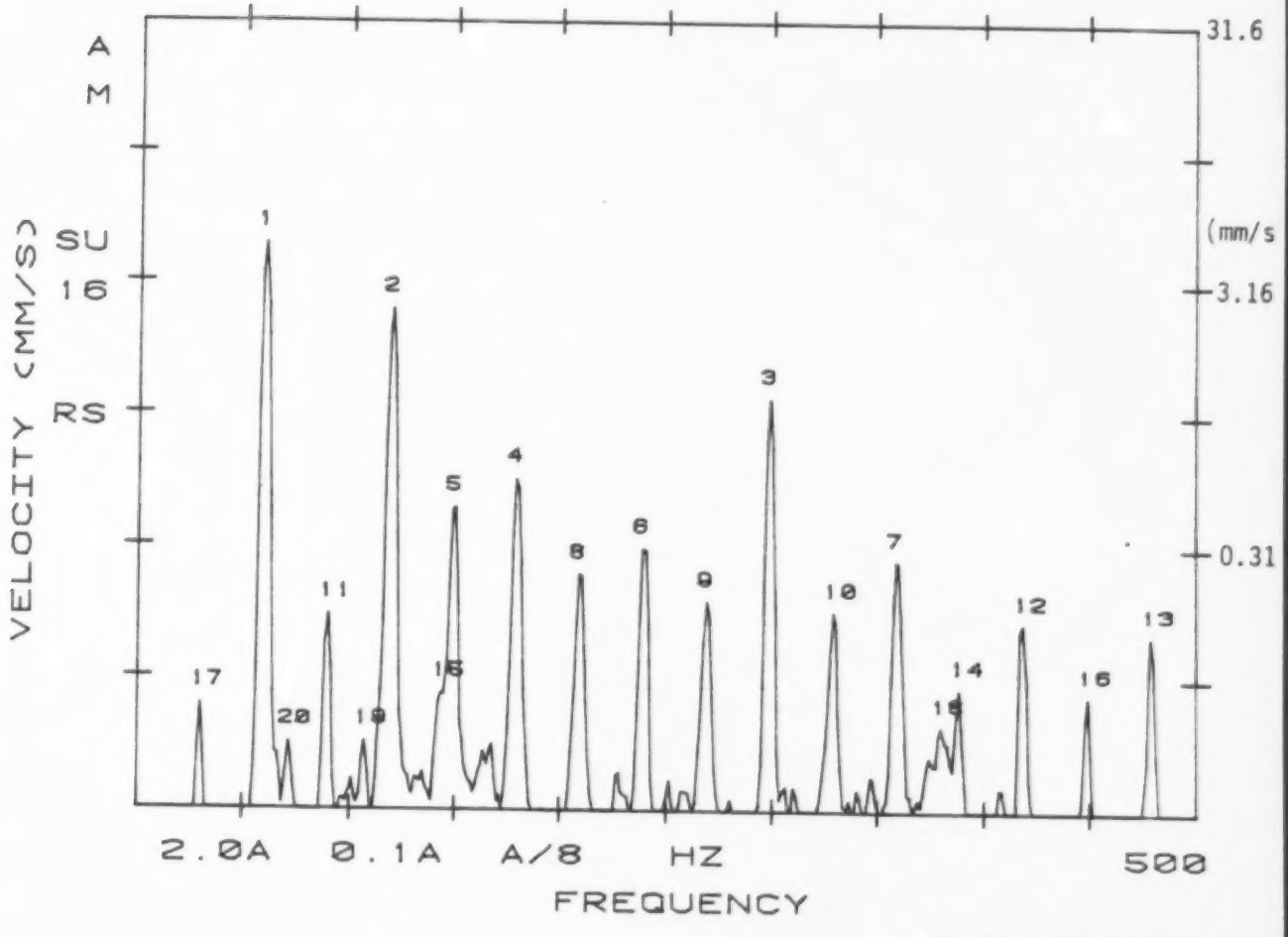

FIGURE D2

PICKERING NGS"B" UNIT#8
BOILER FEED PUMP#6 YE-2 (PUMP)
REACTOR POWER 99% 07/23/86

PEAK NO.	FREQUENCY	AMPLITUDE
1	119.5	1.859
2	12	1.253
3	17	.8084
4	179	.7147
5	26.5	.6278
6	35.5	.5548
7	20.5	.5526
8	34	.5528
9	30.5	.4827
10	28	.4505
11	41.5	.3929
12	22.5	.3025
13	60	.2881
14	118.5	.2002
15	48.5	.1833
16	8.5	.1831
17	48	.1801
18	38.5	.1693
19	114.5	.1665
20	51.5	.1482

25.2-03 V/EA 10.0+00 E VLG

C

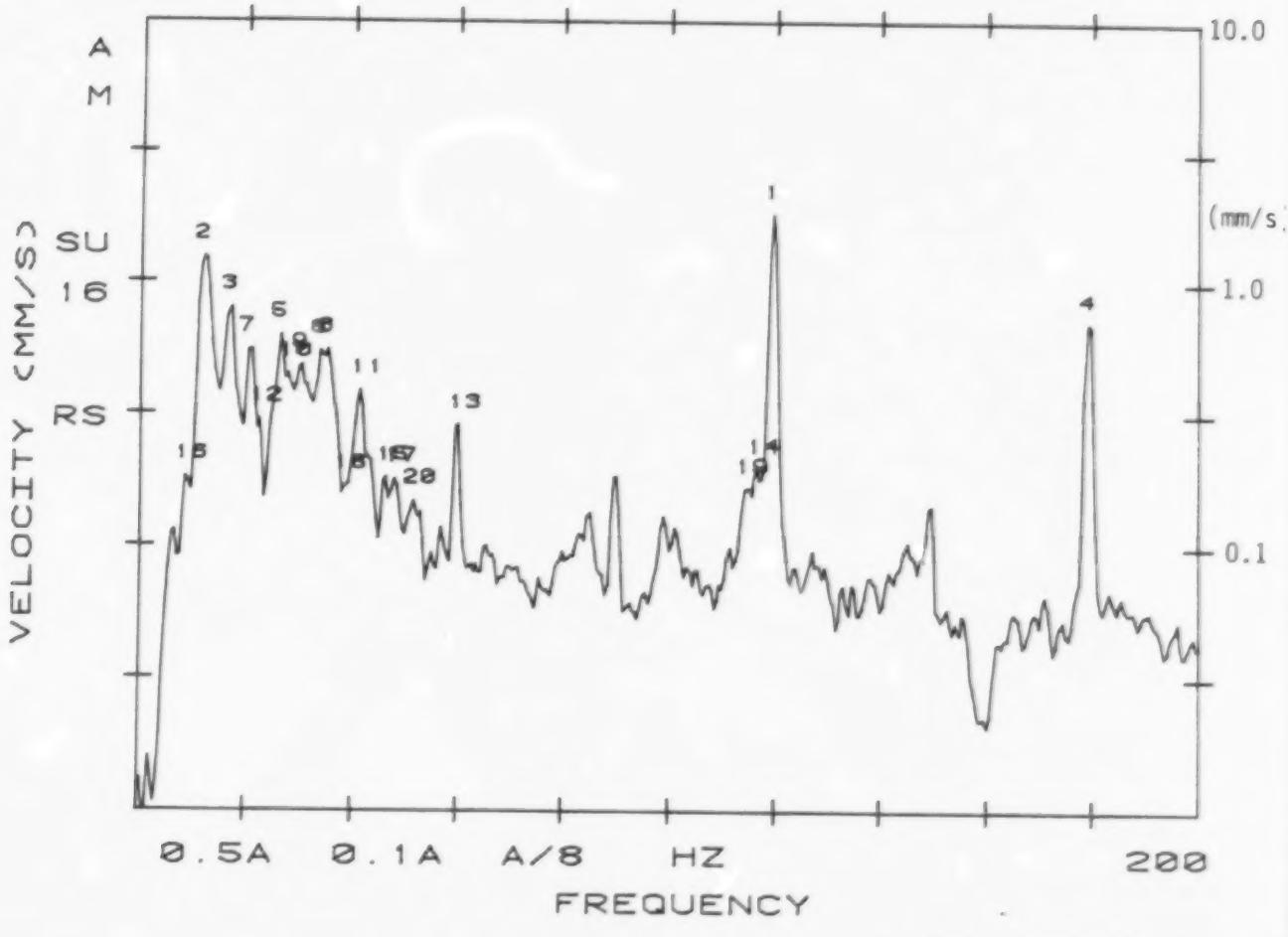

FIGURE D3

PICKERING NGS"B" UNIT#8
BOILER FEED PUMP#6 YE-2 (PUMP)
REACTOR POWER 99% 07/23/86

PEAK NO.	FREQUENCY	AMPLITUDE
1	298.75	2.855
2	12.5	1.851
3	120	1.747
4	418.75	1.457
5	18.25	1.053
6	178.75	.8273
7	20	.77
8	35	.7617
9	27.5	.7576
10	32.5	.7434
11	238.75	.5192
12	41.25	.4912
13	260	.4762
14	268.75	.4666
15	46.25	.3172
16	60	.2997
17	245	.2981
18	281.25	.2678
19	115	.2355
20	90	.2172

25.2-03 V/EA 10.0+00 E VLG

C

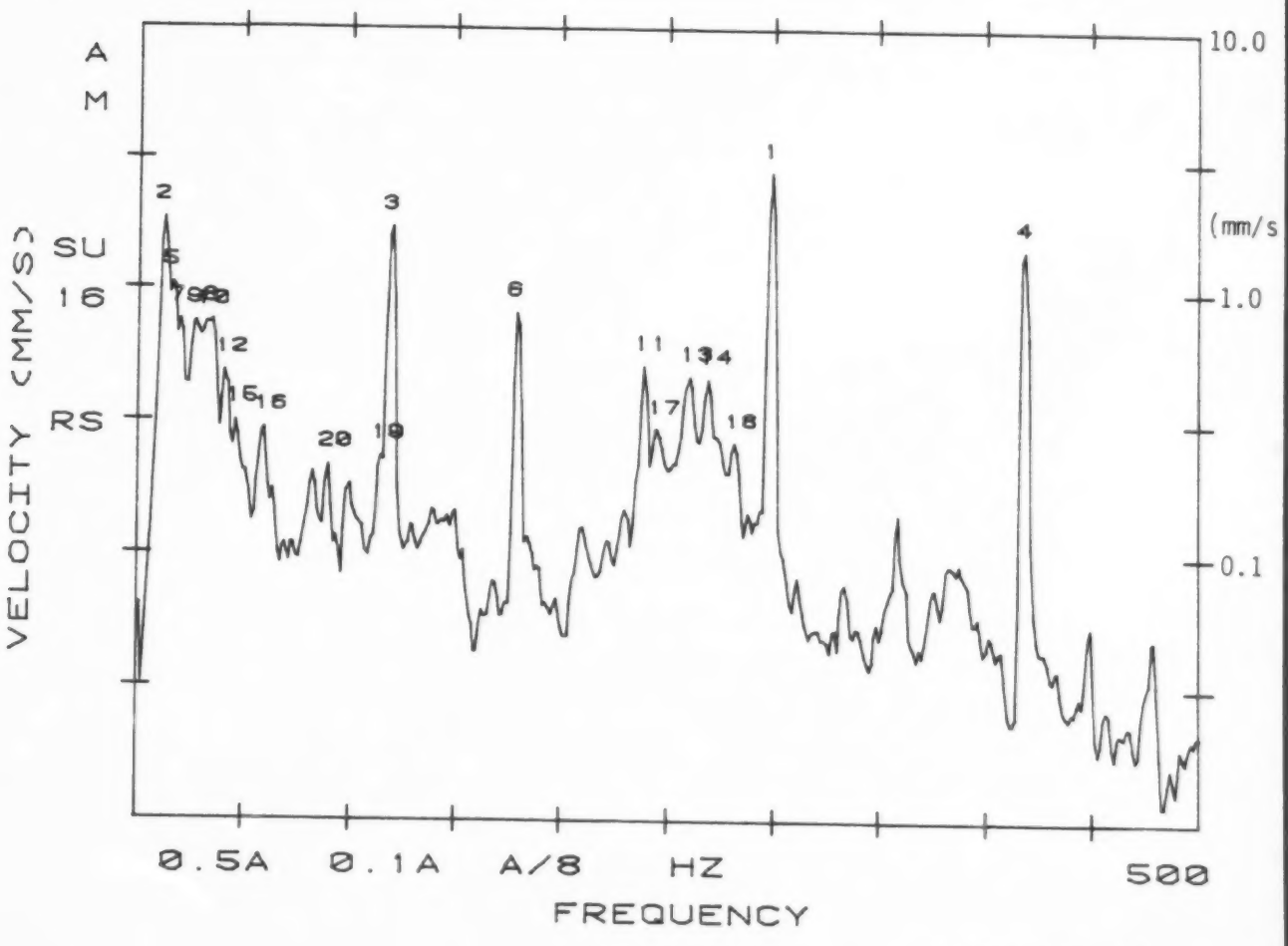

FIGURE D4

86-335

PICKERING NGS"B" UNIT#8
BOILER FEED PUMP8 YE-1 (MOTOR)
REACTOR POWER 99% 07/23/86

PEAK NO.	FREQUENCY	AMPLITUDE
1	60	4.829
2	120	2.308
3	179	.8067
4	149.5	.4873
5	90	.1801
6	82.5	.1054
7	145	.08159
8	30	.07824
9	142.5	.07584
10	107.5	.06368
11	140.5	.06042
12	163.5	.05785
13	166.5	.05754
14	182	.05578
15	71.5	.05199
16	152.5	.05094
17	168	.04295
18	138	.04208
19	131.5	.0387
20	66	.03711

83.6-03 V/EA 10.0+00 E VLG C

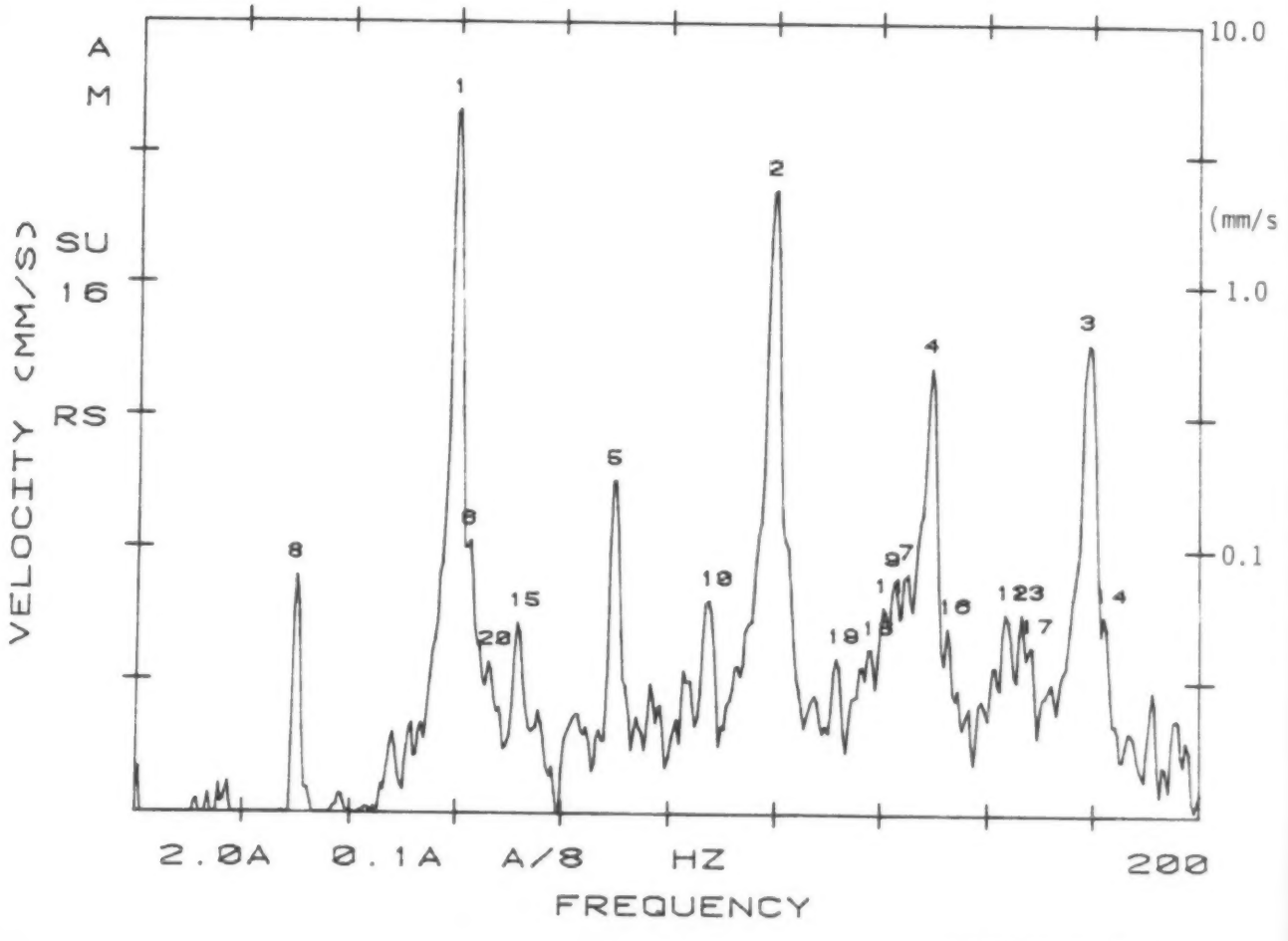

FIGURE D5

86-335

PICKERING NGS"B" UNIT#8
BOILER FEED PUMP8 YE-1 (MOTOR)
REACTOR POWER 99% 07/23/86

PEAK NO.	FREQUENCY	AMPLITUDE
1	60	5.075
2	120	2.385
3	298.75	1.184
4	178.75	.6527
5	150	.5504
6	238.75	.3682
7	358.75	.3545
8	210	.2969
9	328.75	.2503
10	268.75	.2252
11	90	.2122
12	418.75	.1938
13	478.75	.1406
14	388.75	.1336
15	448.75	.1041
16	188.25	.08082
17	30	.07421
18	72.5	.06597
19	108.25	.06124
20	377.5	.06066

83.6-03 V/EA 31.6+00 E VLG

C

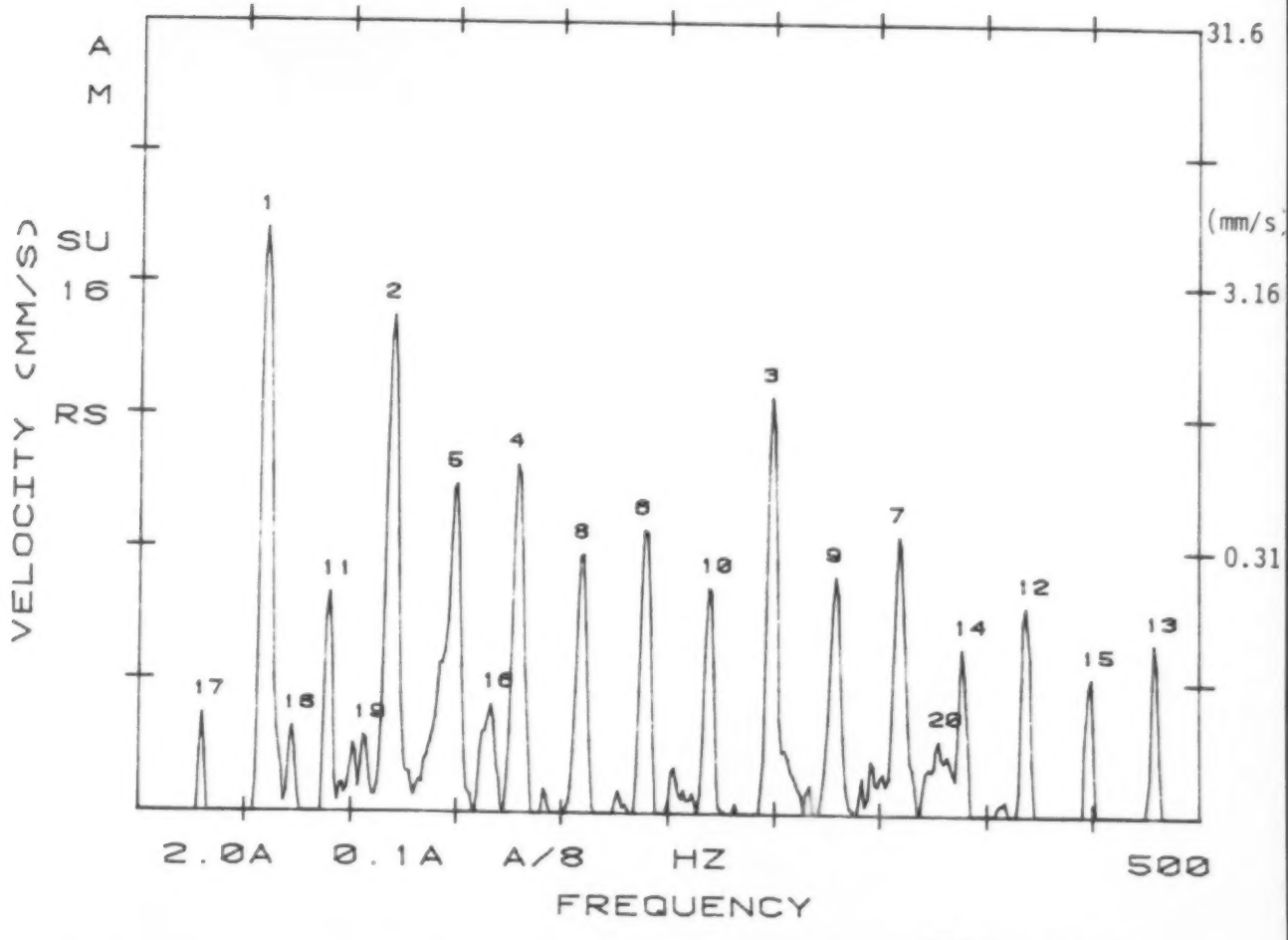

FIGURE D6

PICKERING NGS"B" UNIT#8
BOILER FEED PUMP#8 YE-2 (PUMP)
REACTOR POWER 99% 07/23/86

PEAK NO.	FREQUENCY	AMPLITUDE
1	119.5	1.799
2	12	1.393
3	179.5	.7177
4	17	.6336
5	35.5	.5981
6	21	.5074
7	25.5	.4986
8	29	.4932
9	14.5	.4603
10	27.5	.4256
11	30.5	.4221
12	41.5	.4142
13	22.5	.3993
14	60	.2737
15	39.5	.2523
16	9	.2381
17	117	.216
18	89.5	.2094
19	47.5	.1946
20	115	.1938

25.2-03 V/EA 10.0+00 E VLG

C

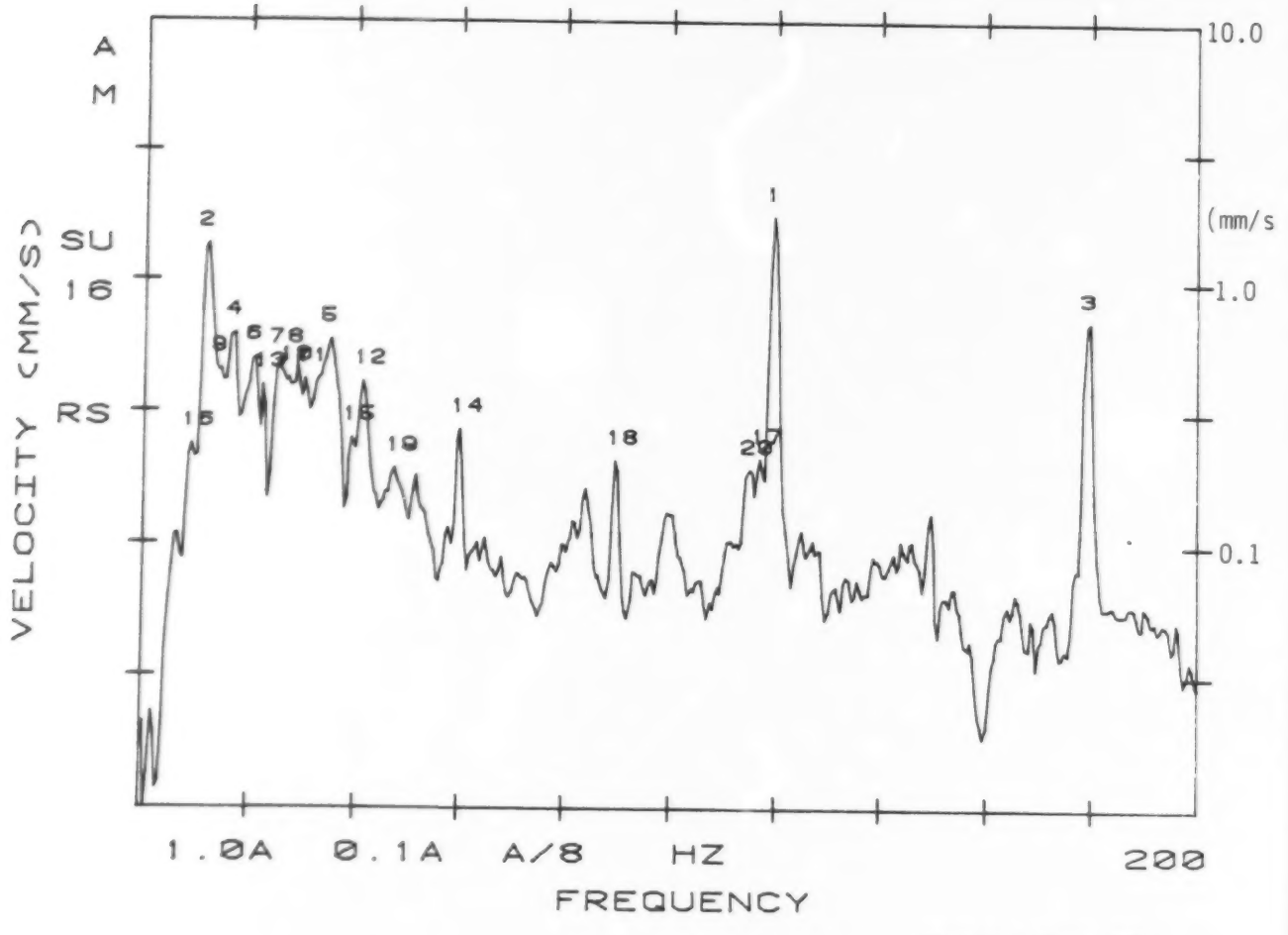

FIGURE D7

86-335

PICKERING NGS"B" UNIT#8
BOILER FEED PUMP#8 YE-2 (PUMP)
REACTOR POWER 99% 07/23/86

PEAK NO.	FREQUENCY	AMPLITUDE
1	298.75	2.851
2	120	2.005
3	418.75	1.497
4	12.5	1.437
5	16.25	1.084
6	35	.8084
7	20	.7815
8	178.75	.7504
9	28.25	.6092
10	238.75	.5809
11	261.25	.4723
12	41.25	.4668
13	288.75	.4048
14	268.25	.3618
15	60	.2997
16	115	.2937
17	247.5	.2909
18	48.25	.2639
19	243.75	.2639
20	90	.2394

25.2-03 V/EA 10.0+00 E VLG

C

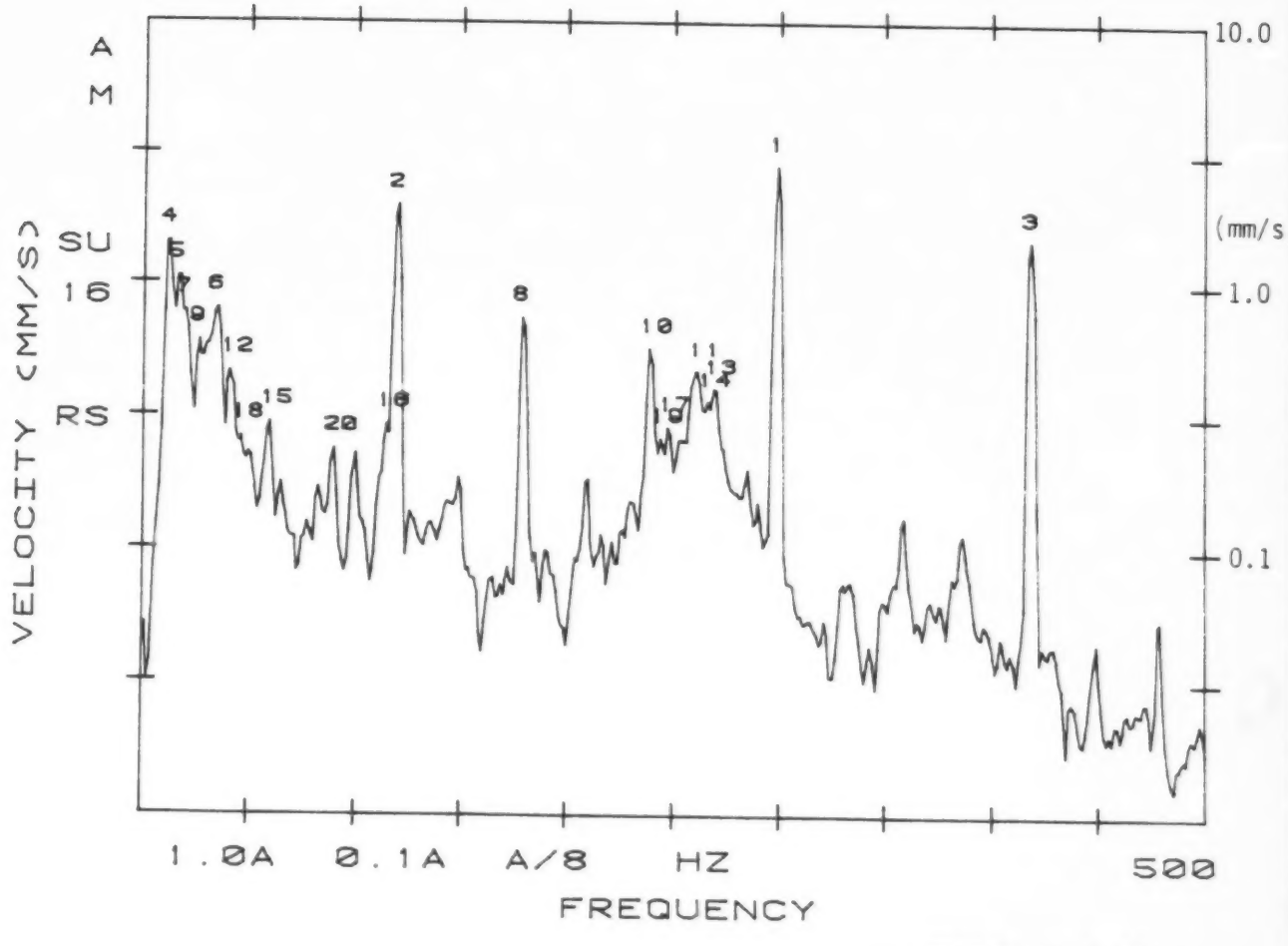

FIGURE D8

DATE: 07/23/86

RECORDED BY: WM

APPENDIX E

PICKERING B UNIT #8 BFP PUMPSETS - TAPE RECORDS AT FULL LOAD 7.5 in/s

TR CH #	PUMP #	MEASUREMENT	TT	YMS AMP GAIN	
TAPE NAME "Pickering B Unit #8 Full Load Records"					
			0-125	Calibration. 3.54 Vrms at 100 Hz. TR attenuation 5:1.	
7 8 9	6 6 6	YE-2 YE-1 Ø	916 -1015	L M	3 Min Record
1 2 3	8 8 8	YE-2 YE-1 Ø	1250 -1370	L M	3 Min Record

YE1 = Motor Vert.
YE2 = Pump Horiz.

(retain this copy for follow-up)

968-7636:0
rev. 7-74

inter-office memo set

to	from	phone no.
M. MC CORMICK	WAYNE MORGAN RESEARCH DIVISION	6739

subject: PICKERING NGSB UNIT #8 VIBRATION MONITORING SYSTEM CHECKOUT FOR BOILER FEED PUMPS

file

date: 11-29-85

A signal check was done from the Boiler Feed Pumps through to the Unit Computer. Computer full scale values are as follows.

YE-1	MOTOR	16.9 mm/sec pk	FOR PUMPSETS
YE-2	PUMP	56.6 mm/sec pk	6, 7 + 8
YE-1	MOTOR	16.9 mm/sec pk	PUMPSET #5
YE-2	PUMP	16.9 mm/sec pk	

All signals checked out OK except for: Pump #5 YE-2, Pump #7 YE-2, Pump #8 YE-1. These signals appear to be working but give a lower reading than expected on the Unit Computer. A wiring check should be done on these signals A DR was filed.

The pickups on the pumps (YE-2) are all mounted vertically and should be mounted horizontally (see UNIT #7 for proper mounting.). A DR was filed.

Impact tests were also carried out on the four pumpsets.

Wayne Morgan.

Instructions: originating - write message, remove pink copy and carbon, forward remainder of set, replying - write reply, snap out carbons, retain white original, return yellow copy

DATA BUSINESS FORMS

86-355

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